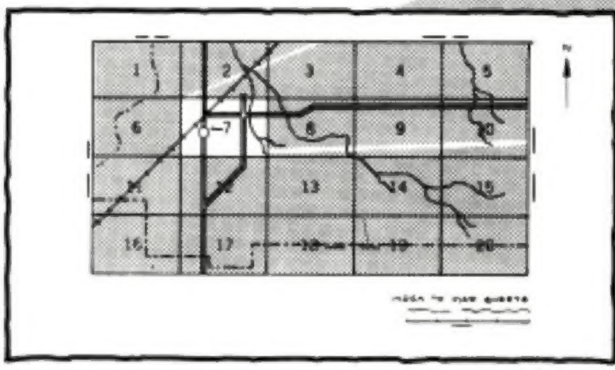
SOIL SURVEY OF

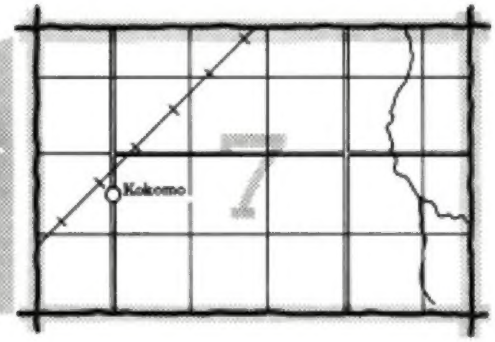
Furnas County, Nebraska

United States Department of Agriculture
Soil Conservation Service
in cooperation with
University of Nebraska Conservation and Survey Division

HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"





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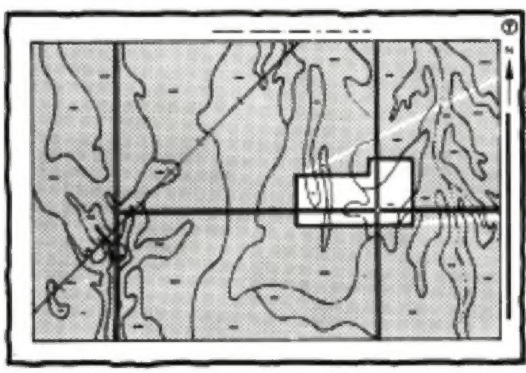

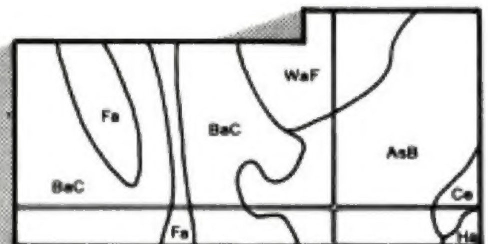

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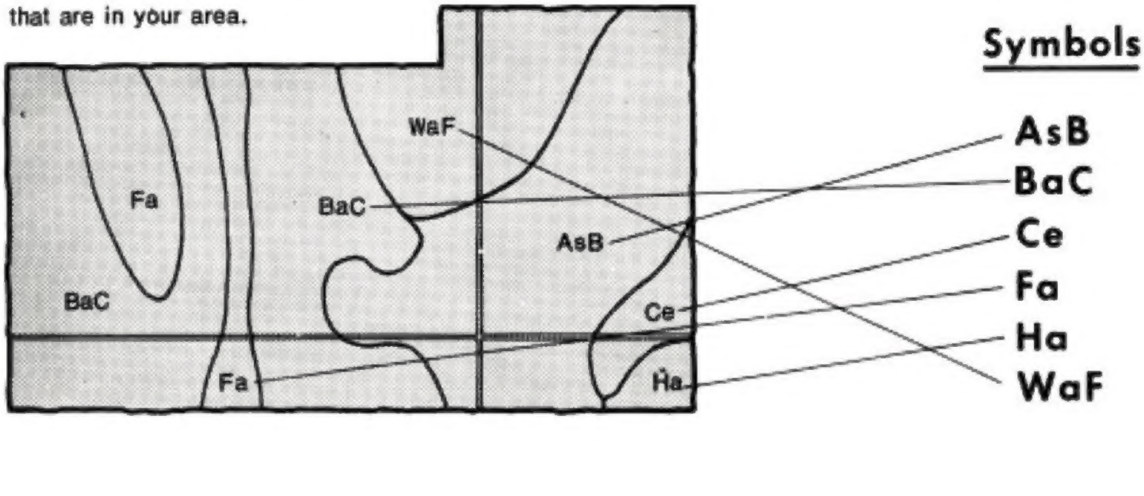
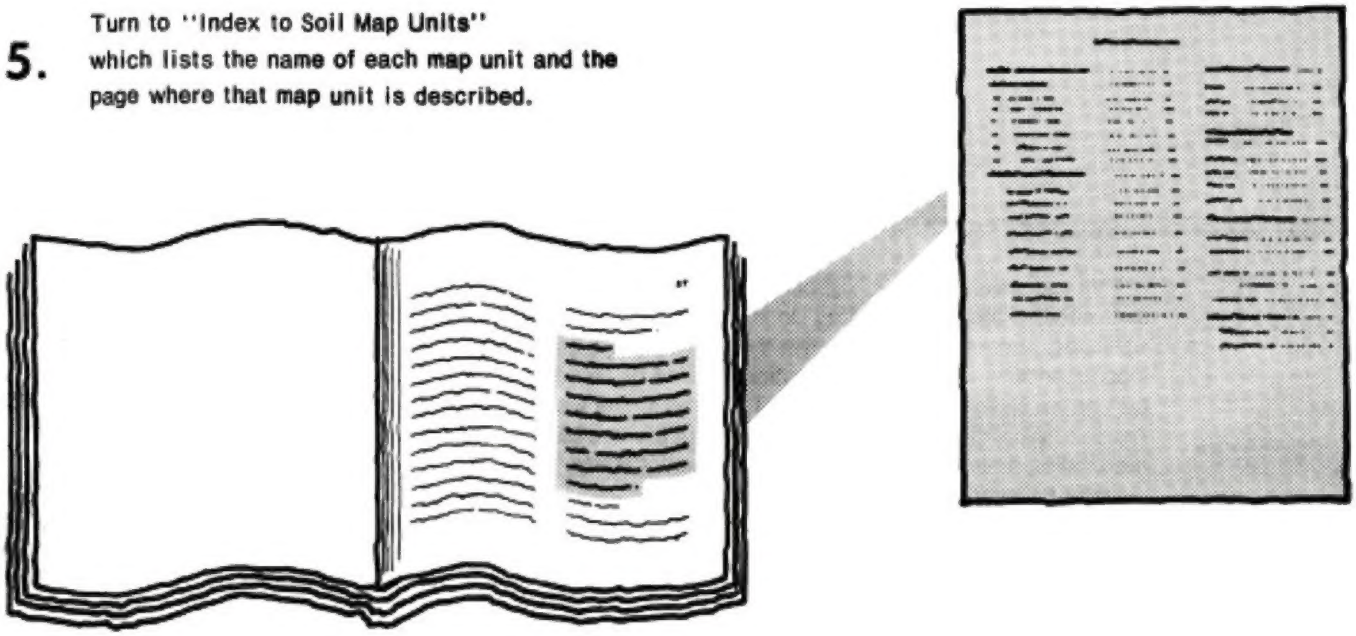
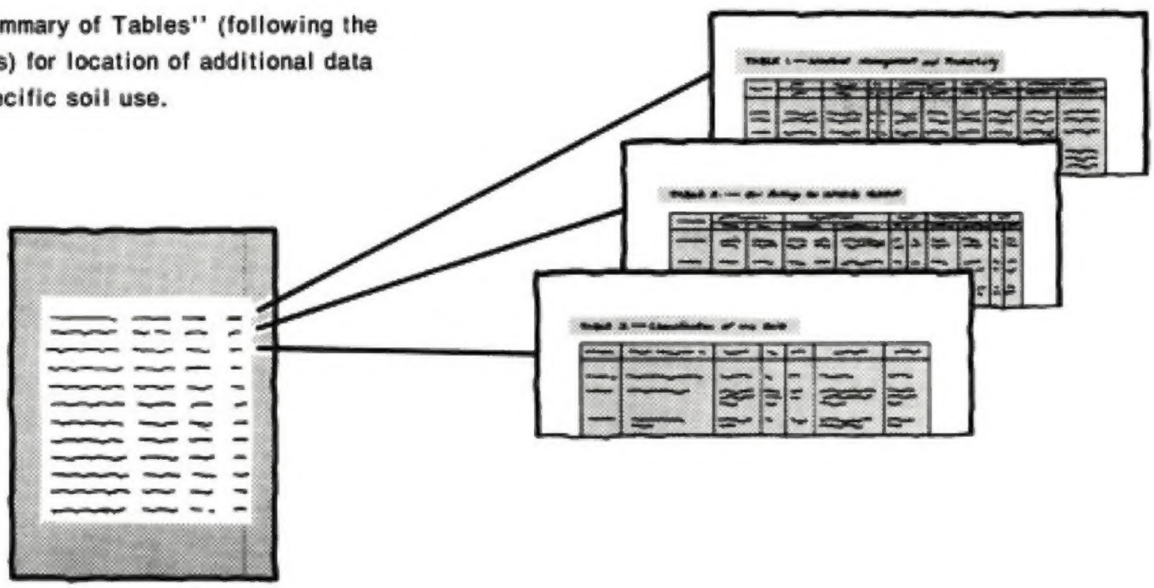


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1967-1974. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska Conservation and Survey Division. It is part of the technical assistance furnished to the Lower Republican Natural Resources District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: The conservation practices on this farm include windbreaks and terraces.

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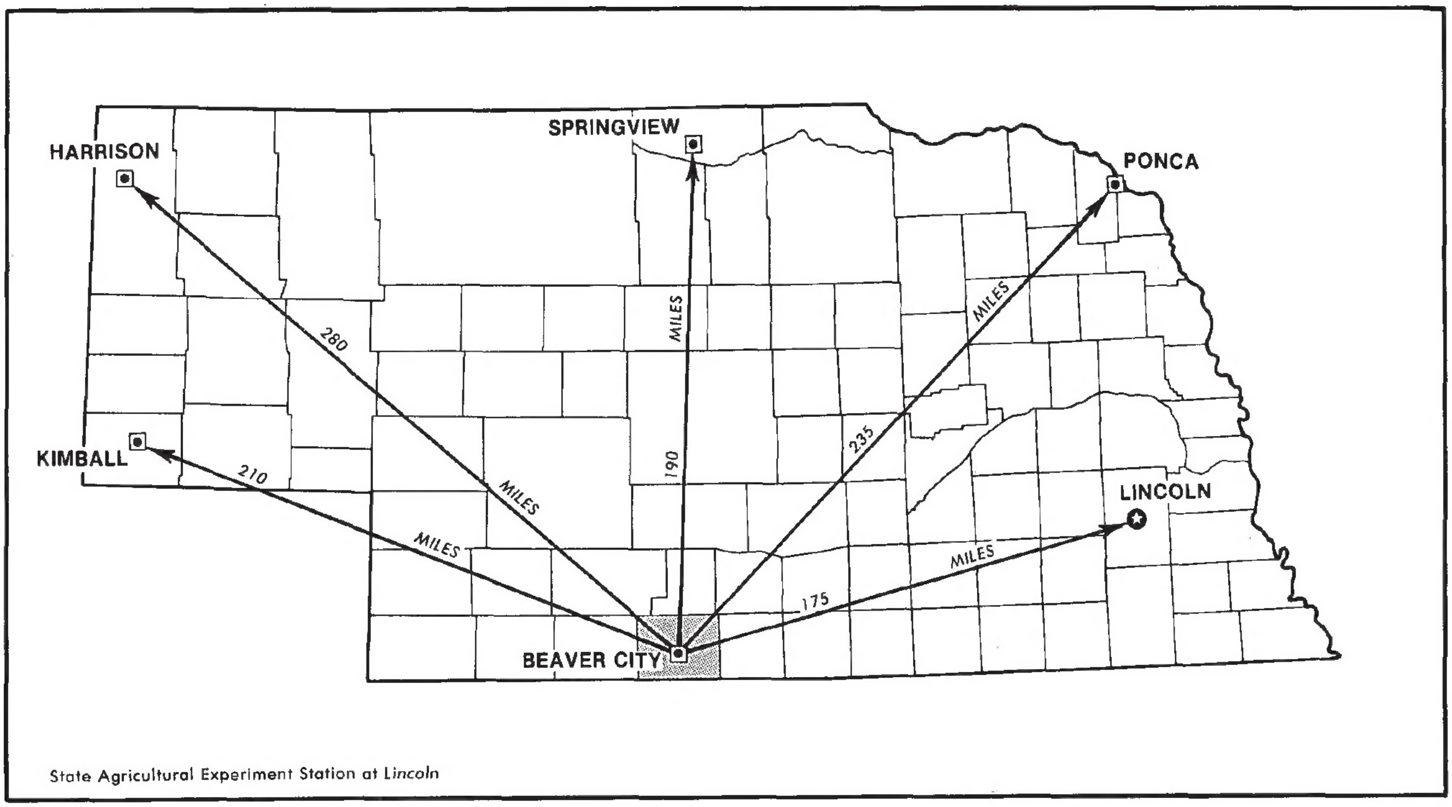

Location of Furnas County in Nebraska.

SOIL SURVEY OF FURNAS COUNTY, NEBRASKA

By Duane L. Rieke, Donald A. Yost, James R. Culver, and John I. Brubacher, Soil Conservation Service

Soils surveyed by Duane L. Rieke, Ronald R. Hoppes, Gilbert L. Bowman, and Laurence E. Brown, Soil Conservation Service, and Frank E. Wahl, Lower Republican Natural Resources District

United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Nebraska Conservation and Survey Division

FURNAS COUNTY is in the south-central part of Nebraska. It is bordered on the south by Kansas. The total area is about 716 square miles, or 462,080 acres. The population of the county in 1880 was 6,407, and in 1930 it was 12,140. It has since declined to 6,897, according to the 1970 census. Beaver City is the county seat. The two largest towns are Arapahoe, which had a population of 1,147 in 1970, and Cambridge, which had a population of 1,145. Other towns in the county are Oxford, Holbrook, Hendley, Wilsonville, and Edison.

The first permanent settlers came to the Republican Valley in 1870. Within the next few years, settlement spread rapidly, first throughout the valleys and later onto the uplands. In 1873, the county was organized with its present boundaries.

Furnas County is part of a broad, gently sloping, loess-mantled plain. About 43 percent of the county consists of broad upland divides that have escaped severe geologic erosion; about 35 percent consists of steeper side slopes on the loess uplands where erosion was more severe; and the rest includes valleys of the Republican River, Beaver Creek, Sappa Creek, and a few of the smaller creeks. The Republican River Valley ranges in width from 1 1/2 miles to slightly more than 3 miles. The valleys of Beaver and Sappa Creeks are more narrow and average about 1 1/2 miles in width. The major valleys consist of stream terraces and bottom lands and have narrow foot slopes adjacent to the uplands.

About 83 percent of the soils in Furnas County are well drained, 12 percent are somewhat excessively drained, 3 percent are moderately well drained, 2 percent are somewhat poorly drained, and about 0.2 percent are poorly drained or very poorly drained. The soils in Furnas County generally are deep. In a few upland areas the soils are moderately deep or are shallow over bedrock of the Ogallala formation, and in a few areas on bottom lands the soils are shallow over mixed sand and gravel.

The soils in Furnas County range from nearly level to very steep. About 18 percent of the soils have a slope of less than 2 percent (nearly level); 32 percent have a slope of 1 to 3 percent (very gently sloping); 6 percent have a slope of 3 to 6 percent (gently sloping); 15 percent have a slope of 3 to 9 percent (gently sloping and strongly sloping); 28 percent have a slope of 9 to 30 percent (strongly sloping to steep); and 1 percent have a slope of 30 to 60 percent (very steep).

The soils generally are well suited to the cultivated crops commonly grown in the county. About 60 percent of the county is cropland. Most of the remaining acreage is in permanent grass and, to a lesser extent, in towns and other uses. Under dryland management, according to the capability classification, about 1.5 percent of the acreage is class I soils, 45.1 percent is class II soils, 6.8 percent is class III soils, 15.7 percent is class IV soils, 0.2 percent is class V soils, 29.3 percent is class VI soils, and 0.9 percent is class VII soils. There are no class VIII soils in Furnas County. About 0.5 percent is water areas and gravel pits.

Agriculture is the main economic enterprise in Furnas County. The main cultivated crops that are grown under dryland management are winter wheat, grain sorghum, corn, and alfalfa hay. Oats are grown on a small acreage. The main irrigated crops are corn, alfalfa hay, and grain sorghum. In January 1976 there were 412 registered irrigation wells in the county. The total acreage of irrigated land is gradually increasing.

Rangeland is important in the county. It makes up about 37 percent of the agricultural acreage. Small cow-calf herds are on most farms that have some permanent grass.

A few small manufacturing plants are located in Furnas County. They manufacture feed wagons, storm windows and doors, and center pivot irrigation systems.

The primary roads in Furnas County are U.S. Highways 34, 136, and 283 and Nebraska Highways 46, 47, and 89. The secondary roads are mainly on section lines and

are gravelled. The Burlington Northern Railroad traverses the Republican River and Beaver Creek valleys.

A survey of Furnas County was published in 1930 (*3*). This survey updates the earlier survey. It provides additional information and larger maps that show the soils in greater detail.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After classifying and naming the soils, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is usable to farmers, managers of rangeland and woodland, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

The general soil map at the back of this publication shows associations that have a distinct pattern of soils, relief, and drainage. Each association is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in others but in a different pattern.

The general soil map provides a broad perspective of the soils and landscape in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one association differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Some soil names and soil boundaries in this survey do not match those in published soil surveys of adjacent counties. Differences result from changes in concepts of soil classification since the publication of those surveys.

Description of associations

1. Holdrege-Uly association

Deep, nearly level to strongly sloping, well drained silty soils; on divides of loess mantled uplands

This soil association consists of alternating broad, nearly level divides and gently sloping to strongly sloping side slopes on the uplands (fig. 1). Most intermittent drainageways are entrenched to a shallow depth.

This soil association makes up about 44 percent of the county. It is about 72 percent Holdrege soils, 16 percent Uly soils, and 12 percent minor soils and miscellaneous areas.

Holdrege soils are deep and well drained and are on broad divides of the uplands. They are nearly level to gently sloping. The surface layer is very friable silt loam

about 11 inches thick. The subsoil is friable silty clay loam about 19 inches thick. The underlying material, to a depth of 60 inches, is lighter colored calcareous silt loam.

Uly soils are deep and well drained and are on the upper part of some side slopes. They are very gently sloping to strongly sloping. They are commonly in areas below Holdrege soils and above Coly soils. The surface layer is very friable silt loam about 10 inches thick. The subsoil is also very friable silt loam about 10 inches thick. The underlying material is lighter colored calcareous silt loam.

The minor soils include Coly, Hobbs, and Fillmore soils. The weakly developed Coly soils are on side slopes and are commonly in a complex with Uly soils. The stratified Hobbs soils are on the bottoms of narrow drainageways. The very slowly permeable Fillmore soils are in shallow depressions on the uplands.

Farms in this association are diversified; they are mainly cash grain and livestock raising farms. Wheat and grain sorghum are the most important crops and are grown under dryland management. A few areas, mainly north of the Republican River, are irrigated, but, for the most part, the potential is low for increased use for irrigated crops. Either a gravity system or center pivot sprinklers are used for irrigation. Corn, alfalfa, and grain sorghum are the main irrigated crops. Cattle and hogs are fattened in a few feedlots. A few farmers have a small cow-calf herd and sell the calves as feeders. Only a small acreage is range.

Water erosion, soil blowing, and drought are the main hazards on the dryfarmed soils. Maintaining fertility and managing irrigation water and crop residue are concerns on irrigated land. Conserving water is important under both dryland and irrigation management.

Farms in this association average 720 acres in size. Gravel or improved dirt roads are on most section lines. Several paved highways cross the area. Most of the cash grain crops are marketed at elevators in the county, but grain sorghum, alfalfa, and corn are commonly fed to livestock directly on the farm. Fattened livestock generally is trucked to large terminals.

2. Coly-Uly-Holdrege association

Deep, gently sloping to very steep, somewhat excessively drained and well drained silty soils; on divides and side slopes of loess mantled uplands

This soil association is on the loess uplands and consists of narrow, gently sloping divides and strongly sloping to very steep side slopes (fig. 2). The drainageways are mostly intermittent; some are fed by springs.

This soil association makes up about 35 percent of the county. It is about 55 percent Coly soils, 22 percent Uly soils, 11 percent Holdrege soils, and 12 percent minor soils.

Coly soils are deep and are well drained and somewhat excessively drained. These soils are mainly on side slopes; some are on narrow ridgetops. They are gently sloping to very steep. In a typical profile, the surface layer is friable silt loam about 5 inches thick. Below that there is a transitional layer of calcareous silt loam about 7 inches thick. The underlying material, to a depth of 60 inches, is lighter colored calcareous silt loam. In many places, Coly soils are in a complex with Uly, Nuckolls, or Holdrege soils.

Uly soils are deep and well drained. These soils are on side slopes and ridgetops. They are gently sloping to steep. In a typical profile, the surface layer is very friable silt loam about 10 inches thick. The subsoil is also very friable silt loam about 10 inches thick, but it is browner than the surface layer. The underlying material, to a depth of 60 inches, is lighter colored calcareous silt loam. In many places, Uly soils are in a complex with Coly soils.

Holdrege soils are deep and well drained and are on narrow divides. They are gently sloping. In a typical profile, the surface layer is very friable silt loam about 11 inches thick. The subsoil is friable silty clay loam about 19 inches thick. The underlying material is lighter colored calcareous silt loam. In places, Holdrege soils are in a complex with Coly soils.

The minor soils include the brownish colored Nuckolls soils on the lower part of side slopes, the stratified Hobbs soils on the bottoms of narrow drainageways, and the Campus and Canyon soils, which formed in caliche, on upland side slopes.

Farms in this association are mainly for growing cash grain crops and for raising livestock. Soils on the divides and on smooth side slopes are used mainly for dryland cultivated crops. Winter wheat and grain sorghum are important crops and are grown under dryland management. Only a few areas are irrigated. The moderately steep and steep areas are mainly used as range. Small cow-calf herds are common. Some areas that were formerly cropland have been seeded to native grass. The potential is low for more irrigation mainly because of the slope.

Water erosion is the main hazard if the soils are cultivated. Soil blowing and drought are also hazards. Proper range use, deferred grazing, and planned grazing systems are needed on rangeland.

Farms in this association average 1,000 acres in size. Gravel or improved dirt roads are on most section lines. A few hard surfaced highways cross the area. Much of the grain sorghum is fed to livestock on the farm. Winter wheat is sold at local elevators. Some beef cattle, mainly calves, are sold as feeders at local auctions, and some are fattened on the farm and sold at large terminals such as Omaha and Denver.

3. Gibbon-McCook-Inavale association

Deep, nearly level, somewhat poorly drained, moderately well drained, and somewhat excessively drained silty, loamy, and sandy soils; on bottom lands

This soil association is mainly on nearly level bottom lands of the Republican River Valley (fig. 3).

This association makes up about 6 percent of the county. It is about 28 percent Gibbon soils, 26 percent McCook soils, 18 percent Inavale soils, and 28 percent minor soils, gravel pits, and areas of water.

Gibbon soils are deep and are somewhat poorly drained. A seasonal high water table is at a depth of 2 to 4 feet. In a typical profile, the surface layer is about 16 inches thick. It is friable silt loam in the upper part and silty clay loam in the lower part. Below that there is a lighter colored transitional layer of very friable silt loam 4 inches thick. The underlying material is light gray very fine sandy loam and silty clay loam in the upper part and is loamy fine sand in the lower part. Gibbon soils are calcareous throughout the profile.

McCook soils are deep and are moderately well drained. In a typical profile, the surface layer is very friable silt loam about 13 inches thick. Below that is a transitional layer of very friable loam. The underlying material is lighter colored very fine sandy loam and loam. These soils are calcareous at or near the surface.

Inavale soils are deep and are somewhat excessively drained. In a typical profile, the surface layer is very friable loamy fine sand about 5 inches thick. Below that there is a transitional layer of loose, slightly lighter colored loamy fine sand. The underlying material, to a depth of 60 inches, is stratified sand, loamy sand, and loamy very fine sand.

The minor soils include the somewhat poorly drained Wann Variant soils, the well drained Munjor soils, and the very poorly drained Barney soils. Barney soils are shallow over mixed sand and gravel and are in low swales. Also included are channels of the Republican River and a few gravel pits.

Farms in this association are diversified and are cash grain and livestock raising farms. Most of the acreage is irrigated. Corn and alfalfa are the main crops. A smaller acreage, mainly near the river channels, is in native grass and trees and is mainly used for range or as habitat for wildlife. The wheat is sold for cash, but grain sorghum and corn are fed on the farm to hogs, chickens, or to cattle in drylots. Irrigation water is plentiful. It mainly comes from shallow wells and is distributed by gravity systems. Only a few sprinkler systems are used.

Soil blowing is the main hazard if the soils are cultivated. Maintaining soil fertility and properly managing irrigation water are concerns if the land is irrigated. Flooding is occasional or rare and can cause crop losses, particularly in the lowest areas.

Farms in this association average 320 acres in size. Gravel or dirt roads are common; however, several hard surfaced highways cross the area. Cash grain is marketed mainly to elevators within the county. Most feeder calves are sold at local auctions, and fattened livestock is trucked to large terminals.

4. Hord-Cozad association

Deep, nearly level and very gently sloping, well drained silty soils; on stream terraces and foot slopes

This soil association is on stream terraces of the Republican River Valley and on foot slopes adjacent to uplands (fig. 3). The areas are mainly nearly level, but a few are very gently sloping.

This soil association makes up about 6 percent of the county. It is about 53 percent Hord soils, 27 percent Cozad soils, and 20 percent minor soils.

Hord soils are deep and are well drained. They are on stream terraces and foot slopes. They are nearly level or gently sloping. In a typical profile, the surface layer is very friable silt loam about 17 inches thick. The subsoil is very friable silt loam about 22 inches thick, and it is browner than the surface layer. Below that, a buried soil that is silt loam and silty clay loam extends to a depth of 60 inches. The soil material is calcareous below a depth of 44 inches.

Cozad soils are deep and well drained. They are on stream terraces and foot slopes. They are nearly level or gently sloping. In a typical profile, the surface layer is very friable silt loam about 14 inches thick. The subsoil is also very friable silt loam about 14 inches thick; it is not so dark in color as the surface layer. The underlying material is lighter colored very fine sandy loam. A buried horizon of silt loam is at a depth of 54 inches. Cozad soils are calcareous below a depth of about 15 inches.

The minor soils include the well drained Hall soils on stream terraces, the moderately coarse textured Anselmo soils on stream terraces, and the stratified Hobbs soils on foot slopes and narrow bottom lands.

Farms in this association are mainly cash grain farms. The main crop is corn. Alfalfa and forage crops are grown on a small acreage and are used mainly as livestock feed. Cattle and some hogs are fattened in a few feedlots. Some grain sorghum is grown for feeding on the farm. Most of the acreage is irrigated by water from wells. The water is distributed mainly by the gravity system, but a few sprinkler systems are also used. Dry-farmed corn, grain sorghum, and wheat also are grown on a small acreage.

Maintaining soil fertility and managing irrigation water are the main concerns of management. Soil blowing and water erosion are minor hazards.

Farms in this association average 240 acres in size. These farms are among the most productive in Furnas County. Gravel roads are on most section lines, and there are several hard-surfaced highways. The towns of Cambridge, Holbrook, Arapahoe, and Oxford in this association are marketing and shopping centers for the

northern half of the county. Cash grain is marketed at local elevators. Fattened livestock is trucked to large terminals.

5. Hord-Hobbs-Cozad association

Deep, nearly level to gently sloping, well drained silty soils; on stream terraces, bottom lands, and foot slopes

This soil association is mainly on stream terraces and bottom lands of Beaver, Sappa, Medicine, and Deer Creeks. It is also on foot slopes adjacent to the uplands. The areas are mainly nearly level or very gently sloping, but a few are gently sloping (fig. 4).

This soil association makes up about 9 percent of the county. It is about 28 percent Hord soils, 27 percent Hobbs soils, 17 percent Cozad soils, and 28 percent minor soils.

Hord soils are deep. They are mainly on stream terraces, but in a few areas they are on foot slopes. They are nearly level to gently sloping. In a typical profile, the surface layer is very friable silt loam about 17 inches thick. The subsoil is very friable silt loam about 22 inches thick, and it is slightly lighter in color than the surface layer. A buried soil that is silt loam and light silty clay loam is below a depth of 39 inches. Hord soils are calcareous below a depth of about 44 inches.

Hobbs soils are deep and nearly level. They are on bottom lands. They are frequently flooded where they are adjacent to creek channels and are occasionally flooded where they are on the second bottoms. The surface layer is very friable silt loam about 24 inches thick; the upper part is stratified. The underlying material is slightly browner silt loam. A buried soil that is silt loam is at a depth of 37 inches.

Cozad soils are deep. They are mainly on bottom lands but are on foot slopes in a few areas. They are nearly level to gently sloping. The surface layer is very friable silt loam about 14 inches thick. The subsoil is very friable silt loam, and it is slightly lighter colored than the surface layer. The underlying material, to a depth of 54 inches, is grayer very fine sandy loam. Below that there is a buried soil that is silt loam.

The minor soils include the well drained Hall soils on stream terraces, the moderately well drained, calcareous McCook soils on bottom lands, and the somewhat poorly drained Gibbon soils on bottom lands.

Most farms in this association are diversified and are cash grain and livestock raising farms. Grain sorghum and winter wheat are the main dryfarmed crops. There is a smaller acreage of corn and alfalfa. A few farms, mainly in the Beaver Creek Valley, are irrigated by the gravity system using water from moderately shallow wells. Corn, alfalfa, and grain sorghum are the main irrigated crops. A few farmers fatten hogs and cattle in small feedlots. Only a small acreage is in permanent vegetation, mainly in the frequently flooded areas along stream channels.

Maintenance of fertility, proper management of irrigation water, and crop residue management are the main concerns if the land is irrigated. Soil blowing and drought are hazards on dryfarmed cropland. Conservation of water is important on dryland and irrigated fields.

Farms in this association average 400 acres in size. Gravel roads are on most section lines. State Highway 89 runs through most of the valley of Beaver Creek. The towns of Wilsonville, Hendley, and Beaver City are marketing and shopping centers in this association. Wheat is sold at local elevators. Most of the corn, alfalfa, and sorghum is fed to livestock on the farm. Fattened livestock generally is trucked to large terminals.

Soil maps for detailed planning

In this section the soil series and map units in Furnas County are described in detail, and the use and management of the soils are discussed. Each soil series is described in detail, and then, briefly, each map unit in that series is described. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the map units in that series. Thus, to get full information about any one map unit, it is necessary to read both the description of the map unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated. The profile described for the series is representative for map units in that series. If a given map unit has a profile that differs from the one described for the series, the differences are stated in the description of the map unit, or they are apparent in the name of the map unit. More detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*4*).

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. The descriptions of these map units together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description,

the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture, slope, degree of erosion, stoniness, salinity, wetness, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Hord silt loam, 1 to 3 percent slopes, is one of several phases within the Hord series.

Most map units include small, scattered areas of soils other than those in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 1, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Some soil names and soil boundaries in this survey do not match those in published soil surveys of adjacent counties. Differences result from changes in concepts of soil classification since the publication of those surveys.

Soil descriptions

Anselmo series

The Anselmo series consists of deep, well drained soils that formed in a mixture of sandy and loamy, wind-reworked soil material. The soils are nearly level and are mainly on stream terraces of the Republican River Valley.

In a representative profile, the surface layer is very friable, dark grayish brown fine sandy loam about 14 inches thick. The subsoil is very friable, light brownish gray fine sandy loam about 19 inches thick. The underlying material, to a depth of 60 inches, is pale brown fine sandy loam.

Permeability is moderately rapid, and the available water capacity is high. Moisture is absorbed easily and released readily to plants.

Anselmo soils are suited to the cultivated crops commonly grown in the area under dryland and irrigation management. They are also suited to grass, trees, and shrubs, to use as habitat for wildlife, and to recreation uses.

Representative profile of Anselmo fine sandy loam, 0 to 2 percent slopes, in a field of alfalfa, 1,960 feet east and 200 feet north of the southwest corner of sec. 35, T. 4 N., R. 25 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—9 to 14 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; gradual smooth boundary.

B2—14 to 33 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; gradual smooth boundary.

C—33 to 60 inches; pale brown (10YR 6/3) fine sandy loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; soft, very friable; mildly alkaline.

The A horizon is 7 to 20 inches thick. The B horizon is mainly fine sandy loam but is light loam in places. The C horizon is mainly fine sandy loam, but loamy fine sand is common below a depth of 30 inches. In places, Anselmo soils are calcareous below a depth of 30 inches. In some areas, a buried soil is at a depth of 30 to 48 inches.

Anselmo soils are near Cozad, Hord, and McCook soils. They have less clay and more sand in the B horizon than Cozad and Hord soils and have more sand and less silt than McCook soils. Unlike McCook soils, Anselmo soils have a B horizon.

An—Anselmo fine sandy loam, 0 to 2 percent slopes. This is a nearly level soil mainly on stream terraces of the Republican River Valley. Most areas are irregular in shape and are 5 to 20 acres in size.

In a few small areas, the surface layer is very fine sandy loam, loamy fine sand, or loam. In small areas where this soil is eroded, the surface layer is light brownish gray or pale brown. In a few areas, lime is near the surface.

Included with this soil in mapping are small areas of the silty Hord and Cozad soils, which are on stream terraces at a slightly lower elevation.

Soil blowing is the main hazard if the surface is not protected. The soil is somewhat droughty, and conserving moisture is a concern, especially under dryland management. The organic matter content is moderately low, and natural fertility is medium. Runoff is slow. Workability is good.

Nearly all the acreage is cultivated, and a few areas are irrigated. This soil is used mainly for wheat, alfalfa, grain sorghum, and corn. It responds readily to fertilizer, especially nitrogen. This soil is well suited to irrigation. Land leveling generally is needed to smooth the slopes for gravity irrigation. Capability units IIe-3, dryland, and IIe-8, irrigated; Sandy range site; windbreak suitability group 3.

Barney series

The Barney series consists of very poorly drained soils that formed in alluvium. The soils are shallow over mixed sand and gravel. They are in long, narrow areas or in crescent-shaped areas on bottom lands of the Republican River Valley. The areas were formerly part of the river channels. Depth to the seasonal high water table ranges from 0 to 2 feet in the spring, receding to about 3 feet late in summer. Barney soils are frequently flooded.

In a representative profile, the surface layer is friable, very dark gray silty clay loam in the upper part and very friable, grayish brown loam in the lower part. It is about 10 inches thick. The underlying material is light gray loamy fine sand in the upper 8 inches, and in the lower part, to a depth of 60 inches, it is sand that is about 7 percent gravel.

Permeability is rapid in the upper part of the underlying material and is very rapid in the lower part. The available water capacity is low. These soils are subject to frequent flooding. Moisture is released readily to plants.

Barney soils are not suited to the cultivated crops commonly grown in the area because the water table is too high and because these soils are flooded frequently. They are suited to grasses, trees, and shrubs that can tolerate excessive wetness. They provide habitat for wildlife and can also be used for certain types of recreation.

Representative profile of Barney silty clay loam, in an area of Barney soils, 0 to 2 percent slopes, in native woodland, 1,300 feet south and 2,200 feet east of the northwest corner of sec. 36, T. 4 N., R. 22 W.

A11—0 to 5 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; massive; hard, friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

A12—5 to 10 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable; slight effervescence; moderately alkaine; abrupt smooth boundary.

IIC1—10 to 18 inches; light gray (10YR 7/2) loamy fine sand, light brownish gray (10YR 6/2) moist; common medium distinct yellowish brown (10YR 5/4) mottles; single grained; loose; slight effervescence; moderately alkaline; clear smooth boundary.

IIC2—18 to 60 inches; light gray (10YR 7/2) sand and about 7 percent gravel, light brownish gray (10YR 6/2) moist; common medium distinct yellowish brown (10YR 5/4) mottles in upper part; single grained; loose; mildly alkaline.

The A horizon is 7 to 10 inches thick. Texture varies within short distances but is mostly silty clay loam, loam, and very fine sandy loam. Depth to the underlying sand and gravel ranges from 10 to 20 inches. The amount of gravel in the IIC horizon is about 5 to 15 percent.

Barney soils are near Gibbon, Inavale, McCook, and Munjor soils. They have more sand between depths of 10 and 40 inches and are more poorly drained than Gibbon, McCook, and Munjor soils. They have more gravel below a depth of 10 inches than Inavale soils. Barney soils have a darker, thicker A horizon and have a higher water table than Inavale soils.

Bn—Barney soils, 0 to 2 percent slopes. This soil is in old abandoned channels adjacent to or near the Republican River. The areas are 10 to 50 acres in size.

The surface layer commonly is silty clay loam or loam but ranges from very fine sandy loam to silty clay. In places, sand and gravel are at a depth of less than 10 inches, and in other places they are at a depth of more than 20 inches. During wet years, the water table is at or above the surface in spring.

The high water table and shallowness to sand and gravel are the main limitations. These areas are subject to frequent flooding. Runoff is slow. The organic matter content is moderately low, and natural fertility is low.

Nearly all the acreage is in native vegetation, mainly grass or mixed grass and trees. These soils are too wet for the production of the cultivated crops commonly grown in the area. The range plants are mainly prairie cordgrass, spikesedge, switchgrass, and willows. When these soils are grazed during wet seasons, they tend to become boggy. A few areas are mowed for hay. Capability unit Vw-7, dryland; Wet Land range site; windbreak suitability group 10.

Campus series

The Campus series consists of moderately deep, well drained soils that formed in material that weathered from calcareous, partially consolidated caliche of the Ogallala formation. These soils are moderately steep and steep. They are on uplands. Most areas have been modified by varying amounts of calcareous, silty, wind-deposited sediment.

In a representative profile, the friable surface layer is dark grayish brown loam in the upper part and grayish

brown clay loam in the lower part. It is about 9 inches thick. The subsoil is firm, light brownish gray clay loam about 12 inches thick. The underlying material, to a depth of 39 inches, is white, calcareous clay loam. In the lower part, to a depth of 60 inches, it is white, partly consolidated caliche that has clay loam material in fractures and crevices. The soil material is calcareous throughout the profile.

Permeability is moderate in the soil material above the caliche, and the available water capacity is moderate or low, depending on the thickness of material over the caliche. Moisture is absorbed easily until the material above the bedrock is saturated; it is released readily to plants.

Because of excessive slopes and the proximity to the shallow Canyon soils, Campus soils are not suited to the cultivated crops commonly grown in the area or to trees and shrubs. They are suited to grass, to use as habitat for wildlife, and to certain recreation uses.

Campus soils are mapped only in a complex with Canyon soils.

Representative profile of Campus loam, in an area of Campus-Canyon loams, 9 to 30 percent slopes, in native grass, 1,750 feet north and 125 feet east of the southwest corner of sec. 24, T. 1 N., R. 22 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; few small hard fragments of caliche; strong effervescence; mildly alkaline; abrupt smooth boundary.

A3—5 to 9 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; numerous worm casts; few small fragments of caliche; strong effervescence; mildly alkaline; clear smooth boundary.

B21—9 to 12 inches; light brownish gray (10YR 6/2) clay loam, dark gray (10YR 4/1) moist; moderate medium granular structure; slightly hard, firm; many worm casts; many small fragments of caliche; strong effervescence; mildly alkaline; clear smooth boundary.

B22—12 to 21 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium granular structure; slightly hard, firm; many small fragments of caliche; strong effervescence; mildly alkaline; gradual smooth boundary.

Cca—21 to 39 inches; white (10YR 8/2) clay loam, light brownish gray (10YR 6/2) moist; common fine and medium distinct yellowish brown (10YR 5/6) moist mottles; massive; slightly hard, firm; many small fragments of caliche; strong effervescence; mildly alkaline; gradual smooth boundary.

Cr—39 to 60 inches; partially consolidated white (10YR 8/2) caliche; pale brown (10YR 6/3) clay loam material in fractures and between fragments; violent effervescence.

The A horizon is 6 to 12 inches thick. The B horizon is clay loam or heavy loam and averages between 18 and 32 percent clay. The Cca horizon is 6 to 20 inches thick. Depth to the partly consolidated caliche is 20 to 40 inches.

Campus soils are near Canyon, Coly, Uly, and Holdrege soils. Campus soils have caliche at a depth of 20 to 40 inches. Caliche is not in the deep Coly, Uly, and Holdrege soils that formed in thick deposits of loess. Campus soils are deeper to the underlying caliche than the shallow Canyon soils.

CcF—Campus-Canyon loams, 9 to 30 percent slopes. These soils are moderately steep to steep and are on uplands. The slopes are mostly short and face westward. These soils are on ridgetops and side slopes. Campus soils are on midslopes and at lower elevations; Canyon soils generally are in narrow bandlike areas at the highest elevations. The pattern varies, however, within short distances. Each area is about 30 to 70 percent Campus soils and about 10 to 30 percent Canyon soils. Areas of this unit are 5 to 60 acres in size.

Included with these soils in mapping are some very steep areas that have outcrops of bedrock. Also included are areas of the deep Nuckolls and Coly soils. Some areas have a narrow, meandering, intermittent drainageway. In places, the surface layer of the Campus soil is noncalcareous. In some areas, the surface layer of both soils is fine sandy loam or light clay loam.

Water erosion is the main hazard on the soils in this map unit. Runoff is rapid. These soils are mildly alkaline, have a high content of lime, and have moderate to low available water capacity. These factors influence the kinds and amounts of native grasses. The Canyon soils have limy sandstone at a depth of 10 to 20 inches that limits the growth of plant roots. The organic matter content of Campus soils is moderately low and that of Canyon soils is low. Natural fertility of Campus soils is medium and that of Canyon soils is low.

Most of the acreage is in native grass and is used as range. These soils are not suited to the cultivated crops commonly grown in the area because of the moderately steep and steep slopes and bedrock at a shallow depth. Capability unit VIe-1, dryland; Campus soil in Limy Upland range site and Canyon soil in Shallow Limy range site; windbreak suitability group 10.

Canyon series

The Canyon series consists of shallow, somewhat excessively drained soils that formed in material that weathered from fine grained, weakly consolidated limy sandstone (fig. 5). These soils are moderately steep and steep and are on uplands.

In a representative profile, the surface layer is friable, grayish brown loam 5 inches thick. Below that there is a transitional layer of friable, light brownish gray loam 4 inches thick. The underlying material, to a depth of 12 inches, is light gray loam. Below this is white, fine grained sandstone.

Permeability is moderate in the soil material above the sandstone. The available water capacity is very low. These soils are droughty because of the limited depth for storage of moisture. Moisture is absorbed easily until the material above the bedrock is saturated.

Canyon soils are not suited to the cultivated crops commonly grown in the area or to trees in windbreaks because of their shallowness and their moderately steep and steep slopes. They are suited to grass, to the development of habitat for wildlife, and to recreation uses.

Canyon soils are mapped only in a complex with Campus soils.

Representative profile of Canyon loam, in an area of Campus-Canyon loams, 9 to 30 percent slopes, in native grass, 2,360 feet south and 150 feet west of the center of sec. 19, T. 2 N., R. 21 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; strong effervescence; mildly alkaline; clear smooth boundary.

AC—5 to 9 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, friable; numerous worm casts; few small fragments of caliche; strong effervescence; mildly alkaline; clear smooth boundary.

C—9 to 12 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable; many small fragments of caliche; strong effervescence; mildly alkaline; abrupt wavy boundary.

Cr—12 to 60 inches; white (10YR 8/2) fine grained sandstone; strong effervescence; difficult to chip with spade.

The A horizon is 3 to 6 inches thick. Typically, Canyon soils are calcareous at the surface, but some pedons do not have free carbonates in the A horizon. The A and AC horizons are mildly or moderately alkaline. The C horizon is commonly loam, but in some areas it is very fine sandy loam. Thin hard beds of caliche are common in some areas.

Canyon soils are near Campus, Coly, Uly, and Holdrege soils. They are shallower to bedrock than Campus soils. Canyon soils have bedrock at a shallow depth, but Coly, Uly, and Holdrege soils are deep and formed in loess.

Coly series

The Coly series consists of deep, well drained and somewhat excessively drained, silty soils that formed in loess (fig. 6). These soils are very gently sloping to steep and are on ridgetops and side slopes on uplands.

In a representative profile, the surface layer is friable, grayish brown silt loam 5 inches thick. Below that is a transitional layer of light brownish gray silt loam about 7 inches thick. The underlying material, to a depth of 60 inches, is light gray silt loam. The profile is calcareous below a depth of about 5 inches.

Permeability is moderate, and the available water capacity is high. Moisture is readily released to plants.

Coly soils are well suited to rangeland or pasture, and in areas where the slope is less than 9 percent, they are suited to cultivated crops. In areas where the slope is more than 9 percent, the hazard of erosion is severe. Coly soils are suited to trees and shrubs where the slope is not too steep. They are also suited to use as habitat for wildlife and to recreation uses.

Representative profile of Coly silt loam, in an area of Coly-Uly silt loams, 9 to 30 percent slopes, in native grass, 25 feet north and 175 feet east of the southwest corner of sec. 17, T. 2 N., R. 25 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable; mildly alkaline; gradual smooth boundary.

AC—5 to 12 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak very fine subangular blocky structure; slightly hard, very friable; many worm casts; few large pores; slight effervescence; mildly alkaline; gradual smooth boundary.

C1—12 to 29 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; slightly hard, very friable; faces of peds coated with lime; slight effervescence; mildly alkaline; gradual smooth boundary.

C2—29 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; few fine soft accumulations of lime; strong effervescence; mildly alkaline.

The A horizon is 3 to 6 inches thick. The soil is calcareous at the surface or to a depth of 10 inches. The AC horizon, if present, ranges from less than 1 inch to 8 inches in thickness. The soil material between depths of 10 and 40 inches is 17 to 25 percent clay.

Coly soils are near Uly, Nuckolls, and Holdrege soils. Unlike these soils, Coly soils have a thinner A horizon, do not have a B horizon, and have lime nearer to the surface. Also, Nuckolls soils formed in material of the Loveland formation.

CbE2—Coly silt loam, 9 to 15 percent slopes, eroded. This soil is on the upper part of side slopes on uplands. The areas are 5 to 50 acres in size.

This soil is similar to the one described as representative of the series, except that the surface layer is lighter in color and is calcareous. All or part of the original surface layer has been removed by erosion. Small rills and gullies are common in most areas. In many places, the present surface layer is silt loam that is similar to the original underlying material.

Included with this soil in mapping are small areas of Hobbs soils on the bottoms of intermittent drainageways. In a few places, Nuckolls soils are on the lower part of side slopes.

Water erosion is the main hazard. The organic matter content and natural fertility are low. Runoff is medium to very rapid, depending mainly on the kind of vegetative cover. Surface crusting is common in the most severely eroded areas where the surface is not protected. The weak structure, the silty texture, and the slope contribute to the high potential for erosion on this soil.

Much of the acreage has been cultivated, but many areas have been seeded to native grasses. A few areas are still in wheat and grain sorghum, but the hazard of erosion in these areas is very severe. A permanent vegetative cover of native grasses is effective in reducing soil erosion. Capability unit VIe-9, dryland; Limy Upland range site; windbreak suitability group 5.

CbG—Coly silt loam, 30 to 60 percent slopes. This soil is in blufflike areas and on side slopes on uplands. The areas are 5 to 150 acres in size. Most of the large areas are on the south side of the Republican River Valley. There are many short, very steep slopes locally referred to as "cat steps."

This soil is similar to the one described as representative of the series, except that the surface layer is thinner. The surface layer is also lighter in color over much of the area because of excessive erosion and a lack of profile development.

Included with this soil in mapping are small outcrops of the Ogallala Formation on the lowest part of the side slopes. Also included are long, narrow areas of Hobbs soils on the bottoms of canyons and Uly soils in some of the smoother areas where the surface layer is thicker.

The very steep slopes severely limit the use of this soil. Water erosion is a severe hazard. Runoff is very rapid. The organic matter content is very low, and natural fertility is low. The high content of lime influences the kinds and amounts of native grasses. Small areas of the steepest slopes are barren. The use of mechanical equipment on this soil generally is not practical. Preventing gully erosion, controlling runoff, and maintaining proper range use are important concerns of management.

All of the acreage is in native grasses and is used for grazing. These areas provide excellent habitat for deer and other wildlife. Capability unit VIIe-9, dryland; Thin Loess range site; windbreak suitability group 10.

CkE2—Coly-Nuckolls silt loams, 9 to 15 percent slopes, eroded. These soils are on side slopes on uplands. Coly silt loam makes up 50 to 80 percent of each mapped area, and Nuckolls silt loam makes up 20 to 50 percent. The Coly soil is on the upper part of side slopes, and the Nuckolls soil is on the lower part. The Nuckolls soil has browner underlying material than the Coly soil. The areas are 10 to 30 acres in size.

The Coly and Nuckolls soils have a profile similar to the one described as representative of their series, except that the surface layer is lighter colored. Also, the Nuckolls soil has a surface layer that is light silty clay loam or heavy silt loam and is thinner.

Included with these soils in mapping are a few small areas of Campus and Canyon soils on the lower part of the side slopes and a few areas of Hobbs soils on the bottom of narrow drainageways.

Water erosion is the main hazard. In places, outcrops of bedrock are on the lower part of side slopes. Small gullies and rills are common. Runoff is rapid. The organic matter content is very low in the Coly soil and low in the Nuckolls soil. Natural fertility is low in the Coly soil and medium in the Nuckolls soil.

Much of the acreage is cultivated, but many areas have been seeded to native grasses. Because of the severe hazard of erosion, these soils are best suited to permanent vegetation. Capability unit VIe-9, dryland; Coly soil in Limy Upland range site and Nuckolls soil in Silty range site; windbreak suitability group 5.

CkF—Coly-Nuckolls silt loams, 9 to 30 percent slopes. These soils are on side slopes on uplands (fig. 7). They are moderately steep and steep and are along tributaries of the Republican River, Beaver Creek, and Sappa Creek. Coly silt loam generally is on the upper part of side slopes, and Nuckolls silt loam is on the lower part. Coly silt loam makes up about 35 to 65 percent of each mapped area and Nuckolls silt loam about 30 to 50 percent. The areas are 40 to 1,000 acres in size.

The Nuckolls soil is the soil described as representative of the series. The Coly soil is similar to the soil described as representative of that series, except that the surface layer is thinner. In a few eroded areas small rills are numerous, and the light colored underlying material is exposed.

Included with these soils in mapping are small, narrow areas of Hobbs silt loam on bottoms of drainageways. Also included are small areas of Uly soils in smoother areas.

Water erosion is the main hazard. Runoff is rapid. Rills and gullies, caused by rapidly moving water, are present in some areas. Flooding of the narrow bottoms in drainageways is common after heavy rains. The organic matter content is low in the Coly soil and is moderately low in the Nuckolls soil. Natural fertility is low in the Coly soil and is medium in the Nuckolls soil.

Most of the acreage is used as native rangeland. Some areas have been cultivated, but they are now reseeded to native or tame grasses. Because of the excessive slope and the potential of high soil loss, these areas generally are not suited to the cultivated crops commonly grown in the area. Capability unit VIe-9, dryland; Coly soil in Limy Upland range site and Nuckolls soil in Silty range site; windbreak suitability group 10.

CmC2—Coly-Uly silt loams, 3 to 9 percent slopes, eroded. These soils are on side slopes on loess uplands. Many areas form the upper part of the drainage system for the landscape. Coly silt loam is on the upper part of side slopes, and Uly silt loam is on the lower part of side slopes. Coly silt loam makes up 40 to 80 percent of each mapped area, and Uly silt loam makes up 20 to 60 percent. The areas are 5 to 40 acres in size.

Coly and Uly soils have a profile similar to the one described as representative of their series, except that the surface layer is thinner and lighter in color. In some areas, the underlying material of the Coly soil and the subsoil of the Uly soil have less clay than is typical of their series. In places, erosion has removed all of the original surface layer and subsoil, and the underlying calcareous material is exposed.

Included with these soils in mapping are areas of Holdrege silt loam on narrow divides and Hobbs silt loam on the bottom of narrow drainageways. Also included are gently sloping and strongly sloping soils on breaks between the bottom lands and stream terraces or on breaks between different levels of stream terraces.

Water erosion is the main hazard. Small rills and gullies are common in cultivated areas. Most of the original surface layer has been removed, and the subsoil or underlying material is exposed. Runoff is rapid. The organic matter content is very low in the Coly soil and is low in Uly soil. Natural fertility is low in the Coly soil and medium in the Uly soil. These soils are fairly easy to till.

Most of the acreage is used for winter wheat and grain sorghum. A few areas have been seeded to native or tame grasses and are used for range or pasture. A few areas remain in native rangeland. Capability units IVe-9, dryland, and IVe-6, irrigated; Coly soil in Limy Upland range site and Uly soil in Silty range site; Coly soil in windbreak suitability group 5 and Uly soil in windbreak suitability group 4.

CmF—Coly-Uly silt loams, 9 to 30 percent slopes. This unit is on side slopes on uplands. Coly silt loam makes up about 40 to 80 percent of each mapped area and generally is on the steepest part of the landscape. Uly silt loam makes up about 20 to 60 percent of each area and generally is on the less sloping upper slopes and ridgetops and on smoother, lower slopes. The areas are 20 to 1,000 acres in size.

The Coly soil has the profile described as representative of the Coly series, and the Uly soil has a profile similar to the one described as representative of the Uly series. In some places, however, the surface layer of both soils is thinner because of water erosion.

Included with these soils in mapping are areas of Hobbs silt loam on the bottoms of the narrow drainageways and Holdrege silt loam in the higher, less sloping areas.

Water erosion is a very severe hazard. Small rills are common. Runoff is rapid. In rangeland, the native grasses provide good protection from erosion, tend to increase water intake, and reduce runoff. The organic matter content is low in the Coly soil and moderately low in the Uly soil. Natural fertility is low in the Coly soil and medium in the Uly soil.

Nearly all of the acreage is in native grass and is used for grazing. A few areas were once cultivated, but nearly all have been reseeded to native grass. In old cultivated fields, gullies are common, and water erosion is difficult to control. Capability unit VIe-9, dryland; Coly soil in Limy Upland range site and Uly soil in Silty range site; windbreak suitability group 10.

Cozad series

The Cozad series consists of deep, well drained soils that formed in alluvium, colluvium, or a mixture of these materials. These soils are nearly level to gently sloping and are on stream terraces and foot slopes in valleys of the Republican River and its tributaries.

In a representative profile (fig. 8), the surface layer is very friable, grayish brown silt loam about 12 inches thick. The subsoil is very friable, light brownish gray silt loam 14 inches thick. The underlying material is light gray very fine sandy loam; it extends to a depth of 54 inches. Below that, a buried soil that is gray silt loam extends to a depth of 60 inches. Typically, the soil material is calcareous below a depth of 15 inches.

Permeability is moderate, and the available water capacity is high. Tilth is good, and the soils are easy to work. Moisture is absorbed easily and released readily to plants.

These soils are suited to the cultivated crops commonly grown in the area under dryland and irrigation management. They are also suited to grass, trees, and shrubs and to use as habitat for wildlife. They are suited to recreation uses, but nearly all areas are used for more intensive purposes.

Representative profile of Cozad silt loam, 0 to 1 percent slopes, in a cultivated field, 1,640 feet south and 670 feet west of the northeast corner of sec. 28, T. 4 N., R. 22 W.

Ap—0 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—9 to 12 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.

B2—12 to 15 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; common worm casts; moderately alkaline; clear smooth boundary.

B3—15 to 26 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; slight effervescence; moderately alkaline; gradual smooth boundary.

C—26 to 54 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

Ab—54 to 60 inches; gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; massive; slightly hard, very friable; slight effervescence; moderately alkaline.

The A horizon is 9 to 16 inches thick. Typically, the B horizon is silt loam, but in some areas it is very fine sandy loam. The C horizon is very fine sandy loam but ranges to include silt loam. Depth to carbonates is 15 to 50 inches. Buried soils are not present in all areas.

Cozad soils are near Hord and Hall soils and, in places, are near McCook soils. They have a thinner solum and have lime higher in the profile than Hord soils. They have less clay in the B horizon than Hall soils. Unlike McCook soils, they have a B horizon, lime at a greater depth, and are not stratified.

Co—Cozad silt loam, 0 to 1 percent slopes. This soil is nearly level and is on stream terraces of the Republican River Valley and its major tributaries. The areas are 15 to 150 acres in size.

This soil has the profile described as representative of the series. In some small areas, the underlying material is very fine sandy loam. In small areas, the grayish brown color of the surface layer extends to a depth of 20 or 30 inches. In a few areas this soil is calcareous at the surface. Some areas have a buried soil at a depth of 40 to 50 inches.

Included with this soil in mapping are small areas of Hall soils.

In some years, insufficient moisture limits production under dryland management. Runoff is slow. Iron and zinc are deficient in some areas where the surface layer has been removed by leveling operations for irrigation. The organic matter content is moderately low, and natural fertility is high. Moisture is absorbed easily and released readily to plants. Tilth is good.

This soil is one of the best in Furnas County for crops. Nearly all the acreage is cultivated, and much of it is irrigated. The main dryland crops are corn, grain sorghum, alfalfa, and wheat. Corn and alfalfa are the main irrigated crops. Capability units IIc-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

CoB—Cozad silt loam, 1 to 3 percent slopes. This soil is very gently sloping and is on stream terraces of the Republican River Valley and its tributaries. The areas are 5 to 50 acres in size, and the largest of these generally are long and narrow.

This soil has a profile similar to the one described as representative of the series, except that the surface layer and subsoil are slightly thinner. In some places, the surface layer is moderately eroded and has less than 8 inches of darkened material; and in some areas this soil is calcareous at the surface. In places the surface layer and subsoil are very fine sandy loam.

Included with this soil in mapping are a few nearly level areas of Cozad silt loam and Hord silt loam.

This soil is droughty in dryfarmed areas. Water erosion and soil blowing are the main hazards. Iron and zinc are deficient in some areas, particularly where the surface layer has been removed by land leveling. The organic matter content is moderately low, and natural fertility is high. Tilth is good.

Most of the acreage is cultivated. Wheat and grain sorghum are the main dryland crops. Many areas are irrigated, mainly for corn and alfalfa. Capability units IIe-1, dryland, and IIe-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

CoC—Cozad silt loam, 3 to 6 percent slopes. This soil is gently sloping and is on side slopes between stream terraces and bottom lands and on foot slopes between uplands and stream terraces. The areas generally are elongated and are 5 to 20 acres in size.

This soil has a profile similar to the one described as representative of the series, except that the surface layer is slightly thinner. In a few small areas, erosion has removed the darkened surface layer and exposed the lighter colored subsoil.

Included with this soil in mapping are a few small, very gently sloping areas of Cozad silt loam. Also included are small areas of Hord soils.

Water erosion is a severe hazard if the soils are cultivated. Soil blowing is a hazard if the surface is unprotected. Runoff is medium. The organic matter content is moderately low, and natural fertility is high. Extensive land leveling generally is needed for gravity irrigation systems. Under dryland management, insufficient moisture commonly limits production. Tilth is good.

Most of the acreage is cultivated, and a small acreage is irrigated. Grain sorghum and wheat are the main dryland crops. Alfalfa and corn are the main irrigated crops. Capability units IIIe-1, dryland, and IIIe-6, irrigated; Silty range site; windbreak suitability group 4.

Fillmore series

The Fillmore series consists of deep, poorly drained soils that formed in loess or loess that has been reworked by water. The soils are mainly in well defined depressions on stream terraces of Sappa Creek Valley. A few small areas are on uplands. A perched water table commonly forms above the claypan after a rain.

In a representative profile, the surface layer is firm, dark gray silty clay loam about 12 inches thick. The subsurface layer is firm, gray silty clay loam about 3 inches thick. The subsoil is about 26 inches thick. It is very firm, dark gray silty clay in the upper part; very firm, gray silty clay in the middle part; and firm, light brownish gray, calcareous silty clay loam in the lower part. The underlying material, to a depth of 60 inches, is light brownish gray silty clay loam.

Permeability is very slow, and the available water capacity is high. Moisture is absorbed slowly and is released slowly to plants. In spring, these soils are commonly wet because runoff ponds after a rain. They dry slowly because outlets are not easy to construct. In summer, when rainfall is lowest and the air temperature is highest, these soils are droughty.

Fillmore soils are suited to cultivated crops, but most areas need artificial drainage. They are also suited to grass, trees, and shrubs, to use as habitat for wildlife, and to recreation uses.

Representative profile of Fillmore silty clay loam, 0 to 1 percent slopes, in annual grasses and weeds, 1,315 feet west and 75 feet south of the northeast corner of sec. 23, T. 1 N., R. 23 W.

A1—0 to 12 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium blocky structure; hard, firm; mildly alkaline; abrupt smooth boundary.

A2—12 to 15 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; hard, firm; mildly alkaline; abrupt smooth boundary.

B21t—15 to 19 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate medium blocky structure; very hard, very firm; mildly alkaline; clear smooth boundary.

B22t—19 to 37 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; moderate medium blocky structure; very hard, very firm; moderately alkaline; clear smooth boundary.

B3ca—37 to 41 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak coarse blocky structure; hard, firm; strong effervescence; strongly alkaline; gradual smooth boundary.

C—41 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, firm; strong effervescence; strongly alkaline.

The A1 horizon is 6 to 12 inches thick. The A2 horizon is silty clay loam or silt loam and is 2 to 4 inches thick. The B2t horizon is silty clay or clay and is 40 to 55 percent clay. The B3ca horizon is 3 to 10 inches thick. Depth to lime ranges from 35 to 60 inches.

Fillmore soils are near Hall soils on stream terraces and near Holdrege soils on uplands. Fillmore soils have more clay in the B horizon than Hall or Holdrege soils and have an A2 horizon that Hall or Holdrege soils do not have.

Fm—Fillmore silty clay loam, 0 to 1 percent slopes. This is a nearly level soil in depressions on stream terraces of Sappa Creek and on uplands. The areas are roughly oval in shape and are 80 to 150 acres in size on the stream terraces and 5 to 15 acres on uplands.

On about 95 percent of the mapped acreage, V-ditches or pits have been dug in the lowest part of the depressions to drain surface water. Part of the remaining acreage has been leveled with soil material obtained from the excavated ditches and pits.

In places, the surface layer extends to a depth of 18 inches. As a result of leveling operations, there are places where the surface layer is silty clay.

Included with this soil in mapping are small areas of Holdrege soils on uplands and Hall soils on stream terraces.

Wetness from flooding is a severe hazard. It delays seedbed preparation and planting. The soil tends to warm up more slowly than better drained soils. The ditches and pits partly solve the drainage problem. During midsummer, this soil is droughty. The organic matter content is moderately low, and natural fertility is medium. Runoff is very slow or is ponded in the low areas. Tilth is fair.

Most of the acreage is cultivated. The most common crops are grain sorghum and corn. A smaller acreage is in alfalfa. Most of the acreage is dryfarmed, but a small part is irrigated. Areas on uplands are mostly in annual grasses and weeds, mainly species that tolerate frequent flooding. Capability units IIIw-2, dryland, and IIIw-1, irrigated; Clayey Overflow range site; windbreak suitability group 2.

Gibbon series

The Gibbon series consists of deep, somewhat poorly drained soils that formed in calcareous, alluvial sediment, mainly on bottom lands of the Republican River Valley. The soils are nearly level. They are in slight depressions. A seasonal high water table is at a depth of 2 to 4 feet in spring and recedes to a depth of 4 to 6 feet in fall.

In a representative profile, the surface layer is very friable and about 16 inches thick. It is dark gray silt loam in the upper part, gray silt loam in the middle part, and gray silty clay loam in the lower 6 inches. Below that, there is a transitional layer of light gray silt loam. The

underlying material is light gray, highly calcareous very fine sandy loam in the upper part and gray silty clay loam in the middle part. In the lower part, below a depth of 44 inches, it is light gray loamy fine sand. Gibbon soils are calcareous throughout.

Permeability is moderate, and the available water capacity is high. Moisture is absorbed easily and released readily to plants. These soils are subject to occasional flooding after heavy rains.

Gibbon soils are suited to the cultivated crops commonly grown in the area under dryland and irrigation management. Some areas near streams are in wooded pasture. These soils are suited to grass, trees, and shrubs, to use as habitat for wildlife, and to recreation uses.

Representative profile of Gibbon silt loam, 0 to 2 percent slopes, in a cultivated field, 1,000 feet north and 50 feet west of the southeast corner of sec. 29, T. 4 N., R. 25 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

A12—7 to 10 inches; gray (10YR 5/1) heavy silt loam, very dark gray (10YR 3/1) moist; massive; slightly hard, friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

A13—10 to 16 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and coarse blocky structure; hard, friable; slight effervescence; moderately alkaline; gradual smooth boundary.

AC—16 to 20 inches; light gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1ca—20 to 29 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; few fine distinct yellowish brown (10YR 5/6) moist mottles; massive; slightly hard, very friable; few worm casts; few fine lime concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C2ca—29 to 39 inches; gray (10YR 6/1) heavy silty clay loam, dark gray (10YR 4/1) moist; weak fine subangular blocky structure; hard, friable; few fine lime concretions; strong effervescence; moderately alkaline; gradual smooth boundary.

C3—39 to 44 inches; light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

IIC—44 to 60 inches; light gray (10YR 7/2) loamy fine sand, light brownish gray (10YR 6/2) moist; few fine distinct yellowish brown (10YR 5/6) moist mottles; single grained; loose, soft; slight effervescence; moderately alkaline.

The A horizon is 8 to 20 inches thick. The upper part of the C horizon is mainly very fine sandy loam, but it ranges to silty clay loam that has thin strata of loam and very fine sand. Typically, the lower part of the C horizon is loamy fine sand, but it ranges from silt loam to gravelly sand. Depth to lime ranges from 0 to 10 inches.

Gibbon soils are near McCook, Munjor, and Inavale soils. Gibbon soils have more clay between depths of 10 and 40 inches and have poorer drainage than McCook and Munjor soils. Gibbon soils have less sand between depths of 10 and 40 inches and are not so well drained as Inavale soils.

Gg—Gibbon silt loam, 0 to 2 percent slopes. This nearly level soil is on bottom lands, mainly in the Republican River Valley. Most areas roughly parallel the Republican River and are 20 to 200 acres in size.

This soil has the profile described as representative of the series. In many areas, it has more sand below a depth of about 24 inches; and in places, the lower part of the profile is stratified, light and dark colored, sandy, loamy, or clayey soil material.

Included with this soil in mapping are small areas of McCook and Munjor soils that are at a slightly higher elevation. In a few small areas the surface layer is saline.

This soil dries slowly after rains, and it is occasionally flooded. The surface layer is very friable, however, and easy to till when it is moist. The water table is highest in spring, and tillage commonly is delayed during the early part of spring. The organic matter content is moderate, and natural fertility is medium. Runoff is slow. Tilth is good.

Most of the acreage is cultivated. The rest is in native grass and is used for hay or pasture. Grain sorghum, corn, and alfalfa are the main dryland crops. A few areas are irrigated, and alfalfa and corn are the main crops. Capability units IIw-4, dryland, and IIw-6, irrigated; Subirrigated range site; windbreak suitability group 2.

Gs—Gibbon silt loam, saline, 0 to 2 percent slopes. This is a nearly level soil on bottom lands. Most areas are irregular in shape and are 10 to 120 acres in size.

This soil is similar to the soil described as representative of the series, except that in the upper 20 inches it has more soluble salts. The water table is slightly higher in this soil than in the typical Gibbon silt loam. A thin, light gray crust commonly is on the surface where the concentration of salts is highest. In places, the underlying material is stratified loamy and sandy material.

Included with this soil in mapping are small areas of Gibbon silt loam, 0 to 2 percent slopes. This included soil is slightly higher in elevation and makes up as much as 25 percent of this map unit.

Surface crusts, lack of good soil structure, and the seasonal high water table make tillage operations difficult. Seedling emergence is reduced because of salinity and the crusts on the surface. The organic matter content is moderately low, and natural fertility is low. Plant nutrients generally are not well balanced. Plants generally respond to applications of nitrogen and phosphorus. Runoff is slow; this soil is occasionally flooded after a heavy rain. Tilth is only fair.

Much of the acreage is cultivated. The concentration of saline salts is a severe limitation to the growing of cultivated crops. This soil is suited to alkali sacaton, switchgrass, and other native grasses that can tolerate the salinity. Capability units IVs-1, dryland, and IIIs-6, irrigated; Saline Subirrigated range site; windbreak suitability group 8.

Hall series

The Hall series consists of deep, well drained soils that formed in alluvium or a mixture of alluvium and loess. The soils are nearly level and are on stream terraces.

In a representative profile, the surface layer is very friable, dark gray, and is about 16 inches thick; the upper part is silt loam, and the lower part is light silty clay loam. The subsoil is about 24 inches thick; it is friable silty clay loam. In the upper and middle parts it is grayish brown, and in the lower part it is light brownish gray. The underlying material, to a depth of 60 inches, is very pale brown calcareous silt loam.

Permeability is moderately slow, and the available water capacity is high. Moisture is readily released to plants. The soils are easy to till.

Hall soils are suited to cultivated crops under dryland and irrigation management. They are also suited to grass, trees, and shrubs, to use as wildlife habitat, and to recreation uses.

Representative profile of Hall silt loam, 0 to 1 percent slopes, in a cultivated field, 1,800 feet south and 150 feet east of the center of sec. 20, T. 1 N., R. 23 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) heavy silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—8 to 16 inches; dark gray (10YR 4/1) light silty clay loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; hard, very friable; neutral; clear smooth boundary.

B1t—16 to 22 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable; neutral; clear smooth bundary.

B2t—22 to 36 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; hard, friable; mildly alkaline; gradual smooth boundary.

B3t—36 to 40 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak coarse blocky; hard, friable; mildly alkaline; gradual smooth boundary.

C—40 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The A horizon is 10 to 20 inches thick. The B1t horizon ranges from grayish brown to dark grayish brown. The A horizon is similar in color to the upper part of the B horizon to a depth of 20 to 34 inches. The B2t horizon is silty clay loam that is 28 to 35 percent clay. Typically, the C horizon is silt loam, but, in places, it is light silty clay loam, loam, or fine sandy loam.

Hall soils are near Hord, Holdrege, and Cozad soils. They have more clay in the B horizon than Hord or Cozad soils. They are deeper to lime than the Cozad soils and have a thicker A horizon. Hall soils have a thicker solum than that of Holdrege soils, and the dark color in the upper part of the B horizon extends to a greater depth.

Ha—Hall silt loam, 0 to 1 percent slopes. This soil is nearly level; it is on stream terraces in the major valleys. Some areas have slightly concave topography. The areas are 5 to 150 acres in size.

On high stream terraces, in 10 to 25 percent of the areas the dark color of the surface layer is less than 20 inches thick.

Included with this soil in mapping are small areas of Hord and Cozad soils at a slightly higher elevation.

Insufficient moisture is the main limitation under dryland management. On the lowest level of stream terraces, however, subirrigation from the underlying water table can benefit dryland alfalfa. Soil blowing is a hazard if the surface is not protected. Runoff is slow. The organic matter content is moderate, and natural fertility is high. This soil is one of the best in Furnas County for cultivated crops. It is easily worked.

Most of the acreage of this soil is in corn, alfalfa, and grain sorghum, and much of it is irrigated. A small acreage is in wheat. Capability units IIc-1, dryland, and I-4, irrigated; Silty Lowland range site; windbreak suitability group 1.

Hobbs series

The Hobbs series consists of deep, well drained soils that formed in recently deposited alluvium. The soils are nearly level and are on bottom lands of the major creeks and smaller streams (fig. 9).

In a representative profile, the surface layer is very friable, stratified silt loam about 9 inches thick. The underlying material is silt loam; the upper part is stratified dark grayish brown and light brownish gray, and the lower part is dark grayish brown. An old buried soil is between depths of 37 and 60 inches or more. Its surface layer is dark gray silt loam, and its subsoil is gray silt loam.

Permeability is moderate, and the available water capacity is high. These soils are easy to till. They are subject to occasional or frequent flooding.

Hobbs soils are suited to cultivated crops under dryland and irrigation management except in frequently flooded areas. They are also suited to grass, trees, and shrubs, to use as habitat for wildlife, and to recreation uses.

Representative profile of Hobbs silt loam, 0 to 2 percent slopes, in introduced grass, 1,500 feet east and 1,050 feet south of the northwest corner of sec. 36, T. 1 N., R. 23 W.

A1—0 to 9 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; few worm casts; neutral; clear smooth boundary.

C1—9 to 24 inches; stratified dark grayish brown (10YR 4/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; few worm casts; neutral; gradual smooth boundary.

C2—24 to 37 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, friable; neutral; abrupt smooth boundary.

Ab—37 to 46 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

Bb—46 to 60 inches; gray (10YR 5/1) heavy silt loam, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; hard, friable; neutral.

The A horizon is 6 to 9 inches thick. Generally, there is no lime in the upper 40 inches, but some profiles have a light colored, calcareous layer that was recently deposited on the surface. Some profiles do not have a buried soil.

Hobbs soils are near McCook, Cozad, and Hord soils. Hobbs soils have more clay than McCook soils and have stratification within a depth of 10 inches. Hobbs soils do not have a B horizon and are more stratified than Cozad and Hord soils.

Hb—Hobbs silt loam, 0 to 2 percent slopes. This soil is mainly on flood plains in narrow upland drainageways. A few areas are on bottom lands of major streams. This soil is at a higher elevation than the channeled phase of Hobbs silt loam. Most areas are elongated in shape and are 5 to 50 acres in size.

This is the soil described as representative of the series. In few small areas, the surface layer is very fine sandy loam. In some areas, lime is at or near the surface as a result of recent deposition.

Included with this soil in mapping are small areas of McCook and Hord soils, which are at slightly higher elevations.

This soil is highly productive; the organic matter content is moderate, and natural fertility is high. Runoff is slow. Occasional, generally brief, floods are the major hazard for crop production; however, in years when the amount of rainfall is below normal, the floodwater, if it is not too rapid, can benefit crop production. Tilth is good.

This soil is used for hay, range, and cultivated crops. The cultivated acreage is mainly in alfalfa, grain sorghum, and forage sorghum. Many areas are still in native vegetation. Capability units IIw-3, dryland, and IIw-6, irrigated; Silty Overflow range site; windbreak suitability group 1.

Hc—Hobbs silt loam, channeled, 0 to 2 percent slopes. This soil is on narrow bottom lands along intermittent and flowing streams, most of which have a meandering channel. It is bordered by sloping soils of the adjacent uplands. The areas are frequently flooded by stream overflow and by runoff from the adjacent uplands. Flooding commonly occurs in spring, but it can occur during any period when rains are heavy. The floodwater moves off fairly rapidly. The water table is below a depth of 10 feet.

This soil has a profile similar to the one described as representative of the series, except that it commonly has strata of very fine sandy loam and loam. Organic debris and silty soil material are commonly deposited on the surface during each flood. This soil is noncalcareous throughout, but in places it has thin strata that have lime.

Included with this soil in mapping are small areas of Hobbs silt loam, 0 to 2 percent slopes, that are at a higher elevation and are not channeled.

The content of organic matter is moderate, and natural fertility is high. Vegetation consists of trees and a fair cover of grasses and weeds. The grass is commonly damaged by silt deposited during flooding.

Because of the very severe hazard of flooding, this soil is not suited to the cultivated crops that are common to the survey area. Also, the use of large machinery is impractical because the areas are dissected by stream channels. This soil is used almost entirely for grazing and wildlife habitat. Capability unit VIw-7, dryland; Silty Overflow range site; windbreak suitability group 10.

Hm—Hobbs-McCook silt loams, 0 to 2 percent slopes. These soils are mainly on the bottom lands of Beaver Creek and Sappa Creek. Hobbs silt loam makes up about 30 to 70 percent of each area and is on the lower part of the landscape. McCook silt loam makes up 20 to 40 percent of each area and is slightly higher on the landscape than the Hobbs soil.

Included with these soils in mapping are areas of soils that are similar to the Hobbs soil except that they are calcareous to a depth of 3 or 4 feet. Also included are areas of soils that are similar to the McCook soils except that the upper part of the underlying material is 18 to 25 percent clay.

These soils are highly productive; the organic matter content is moderate, and natural fertility is high. Runoff is slow. Brief periods of flooding, which occur about 1 or 2 years in 5, constitute the major hazard for crop production; however, if flooding is not too deep and is brief, it can increase crop production. Tilth is good.

Nearly all of the acreage is in dryfarmed crops; only a small acreage is irrigated. Alfalfa, corn, grain sorghum, and forage are the principal crops. Capability units IIw-3, dryland, and IIw-6, irrigated; Silty Overflow range site; windbreak suitability group 1.

Holdrege series

The Holdrege series consists of deep, well drained soils that formed in loess. These soils are nearly level to gently sloping and are on uplands (fig. 10).

In a representative profile, the surface layer is very friable, dark grayish brown silt loam 11 inches thick. The subsoil is 19 inches thick. It is friable, grayish brown silty clay loam in the upper part; friable, grayish brown silty clay loam in the middle part; and friable, pale brown light silty clay loam in the lower part. The underlying material, to a depth of 60 inches, is very pale brown, calcareous heavy silt loam.

Permeability is moderate, and the available water capacity is high. Moisture is released readily to plants.

Holdrege soils are suited to the cultivated crops commonly grown in the area under dryland and irrigation management. They are also suited to grass, trees, and shrubs, to use as wildlife habitat, and to recreation uses.

Representative profile of Holdrege silt loam, 1 to 3 percent slopes, in a cultivated field, 1,320 feet west and 600 feet south of the northeast corner of sec. 28, T. 3 N., R. 22 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—8 to 11 inches; dark grayish brown (10YR 4/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, very friable; common very fine pores; neutral; clear smooth boundary.

B21t—11 to 14 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak fine subangular blocky; hard, friable; common very fine pores; few worm casts; neutral; clear smooth boundary.

B22t—14 to 19 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable; common very fine pores; few krotovinas; mildly alkaline; gradual smooth boundary.

B3—19 to 30 inches; pale brown (10YR 6/3) light silty clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable; common very fine pores; few krotovinas; mildly alkaline; clear smooth boundary.

C—30 to 60 inches; very pale brown (10YR 7/3) heavy silt loam; brown (10YR 5/3) moist; massive; soft, friable; few very fine pores; strong effervescence; moderately alkaline.

The A horizon is 8 to 14 inches thick. In some profiles, the upper part of the B horizon is dark grayish brown to a depth of as much as 20 inches. Some profiles have a B1 horizon that ranges from dark gray to grayish brown and is heavy silt loam or light silty clay loam. The B2t horizon is silty clay loam that is 28 to 35 percent clay. In some profiles, an accumulation of lime is in the lower part of the B3 horizon. The C horizon ranges from heavy silt loam to light silty clay loam. Depth to lime ranges from 20 to 36 inches.

Holdrege soils are near Uly and Coly soils. Holdrege soils have a thicker B horizon, have more clay in the B horizon, and are deeper to lime than Uly soils. Holdrege soils have a thicker A horizon, have a silty clay loam B horizon, and are deeper to lime than Coly soils.

Ho—Holdrege silt loam, 0 to 1 percent slopes. This soil is nearly level and is mainly on divides of loess uplands. Most areas are irregular in shape and are 10 to 100 acres in size.

This soil has a profile similar to the one described as representative of the series, except that the surface layer and subsoil are slightly thicker.

Included with this soil in mapping are small areas of Hall silt loam and areas of eroded Holdrege silt loam.

Insufficient moisture during years of average or below average rainfall is the main limitation to crop production in dryfarmed areas. Soil blowing is a hazard if the surface is not adequately protected. This soil is very friable and easy to work. Runoff is slow. The organic matter content is moderate, and natural fertility is high. This soil

is one of the best in Furnas County for cultivated crops. Tilth is good.

Nearly all the acreage is cultivated, and a small acreage is irrigated. Wheat and grain sorghum are the main crops, but corn and alfalfa are also grown on a small acreage. Capability units IIc-1, dryland, and I-4, irrigated; Silty range site; windbreak suitability group 4.

HoB—Holdrege silt loam, 1 to 3 percent slopes. This is a deep, very gently sloping soil on broad ridgetops of loess uplands. The areas are 5 to 100 acres in size.

This soil has the profile described as representative of the series. In some areas, the dark color of the surface layer extends into the subsoil to a depth of 20 to 30 inches. On many of the narrow ridgetops, this soil is eroded and has a thinner surface layer.

Included with this soil in mapping are a few small areas of Coly and Uly soils.

Conserving moisture and controlling erosion are the major concerns. Runoff is medium. The organic matter content is moderate, and natural fertility is high. In dryland areas, an inadequate supply of moisture during years of average or below average rainfall is a common limitation to crop production. Some land leveling generally is needed for gravity irrigation. This soil is easy to work.

Most of the acreage is used for dryland cultivated crops. Some areas are irrigated, and a few areas are in native grass. Wheat and grain sorghum are the main dryland crops. Corn is the main irrigated crop. Capability units IIe-1, dryland, and IIe-4, irrigated; Silty range site; windbreak suitability group 4.

HoC—Holdrege silt loam, 3 to 6 percent slopes. This is a gently sloping soil on side slopes and ridgetops of the loess uplands. Most areas are elongated in shape and are 5 to 50 acres in size.

In a few areas, the surface layer is only as thick as the plow layer, and the subsoil is only about 12 inches thick.

Included with this soil in mapping are small areas of Uly and Coly soils, mainly at the highest elevations. Also included are a few areas of Holdrege silt loam, 1 to 3 percent slopes.

Water erosion is the main hazard if the soils are cultivated. Soil blowing is a hazard if the surface is not protected. Runoff is medium. The organic matter content is moderate, and natural fertility is high. Tilth is good.

Most of the acreage is in native grass. A small acreage is cultivated and is used mainly for wheat and grain sorghum. Capability units IIIe-1, dryland, and IIIe-4, irrigated; Silty range site; windbreak suitability group 4.

HoC2—Holdrege silt loam, 3 to 6 percent slopes, eroded. This is a gently sloping soil on side slopes and ridgetops of loess uplands. The areas are 5 to 150 acres in size.

This soil has a profile similar to the one described as representative of the series, except that the surface layer is lighter colored and thinner, the subsoil is thinner, and lime is nearer to the surface. In places, the present surface layer is a mixture of the remaining original surface layer and the upper part of the subsoil and is light silty clay loam.

Included with this soil in mapping are small areas of Uly and Coly soils in the highest areas and very gently sloping Holdrege silt loam.

Water erosion and soil blowing are hazards if this soil is cultivated. Runoff is medium. The organic matter content is moderately low, and natural fertility is medium. In places, rills and small gullies form, but they generally are filled in during each successive tillage. Surface crusting after heavy rains is common in areas where erosion is most severe. Tilth is fair.

Most of the acreage is cultivated and is used mainly for wheat and grain sorghum. Dryland management is used in nearly all areas. A few areas are in native grass. Capability units IIIe-1, dryland, and IIIe-4, irrigated; Silty range site; windbreak suitability group 4.

HpB2—Holdrege-Coly silt loams, 1 to 3 percent slopes, eroded. These soils are on broad divides of loess uplands. The Holdrege soil makes up 40 to 65 percent of each mapped area and the Coly soil 20 to 40 percent. The Coly soil is steeper than the Holdrege soil and is commonly on the higher knolls and side slopes. The Holdrege soil is generally at a lower elevation than the Coly soil. The areas are 5 to 35 acres in size.

The Holdrege soil has a profile similar to the one described as representative of the series, except that the surface layer is thinner and is slightly finer textured. The present surface layer is a mixture of material from the remaining original surface layer and material from the upper part of the subsoil. In a few places, it is silty clay loam. The Coly soil has a lighter colored surface layer than the one described as representative of the series.

Included with these soils in mapping are a few small areas of Uly soils on the lower part of side slopes.

Water erosion and soil blowing are moderate hazards. Runoff is medium. The organic matter content is moderately low in the Holdrege soil and is very low in the Coly soil. Natural fertility is medium in the Holdrege soil and is low in the Coly soil. These eroded soils are easily worked, but they are not so friable as soils that are not eroded. The Coly soil tends to crust upon drying after a rain. Care is needed to apply the correct amount of herbicides. Tilth is fair.

Nearly all the acreage is cultivated, and it is used mainly for wheat and grain sorghum. Dryland management is used in nearly all areas. A few areas are in native grass. Capability unit IIe-8, dryland, and IIe-4, irrigated; Holdrege soil in Silty range site and Coly soil in Limy Upland range site; Holdrege soil in windbreak suit-

ability group 4 and Coly soil in windbreak suitability group 5.

HpC2—Holdrege-Coly silt loams, 3 to 6 percent slopes, eroded. These soils are on ridgetops and side slopes on loess uplands. The Holdrege soil makes up 40 to 60 percent of each mapped area, and the Coly soil makes up about 25 to 45 percent. The Coly soil commonly is on the higher part of the ridges and side slopes, and the Holdrege soil is at a lower elevation. The areas are 5 to 50 acres in size.

The Holdrege soil has a profile similar to the one described as representative of the series, except that the surface layer and subsoil are slightly thinner and lime is nearer to the surface. In a few places, the surface layer is silty clay loam. Where erosion has removed most of the original surface layer of the Holdrege soil, tillage has mixed the remaining surface layer and material from the upper part of the subsoil. The Coly soil has a thinner and lighter colored surface layer than the one described as representative of the series. In places, the surface layer has been removed by erosion.

Included with this soil in mapping are a few small areas of Uly soils on the lower part of side slopes.

Water erosion is a severe hazard if the soils are cultivated. Soil blowing is a hazard where the surface is not adequately protected. Runoff is medium. The organic matter content is moderately low in the Holdrege soil and very low in the Coly soil. Natural fertility is medium in the Holdrege soil and low in the Coly soil. These Holdrege and Coly soils are easily worked; nevertheless, these soils are more easily worked where they are not eroded. Rills and small gullies are common. Insufficient moisture commonly limits production under dryland management. The content of available nitrogen and phosphorus is low. Tilth is fair.

Nearly all the acreage is cultivated under dryland management, and it is used mainly for wheat and grain sorghum. A few small areas are in native grass. Capability units IIIe-8, dryland, and IIIe-4, irrigated; Holdrege soil in Silty range site and Coly soil in Limy Upland range site; Holdrege soil in windbreak suitability group 4 and Coly soil in windbreak suitability group 5.

Hord series

The Hord series consists of deep, well drained soils that formed in alluvium or in a mixture of alluvium and loess. These soils are nearly level to gently sloping and are on stream terraces and foot slopes.

In a representative profile, the surface layer is very friable, dark grayish brown silt loam 17 inches thick. The subsoil, to a depth of 39 inches, is very friable silt loam. It is grayish brown in the upper part and light brownish gray in the lower part. Below this, to a depth of 48 inches, there is a buried soil that is grayish brown silt loam and light silty clay loam. The underlying material, to a depth of 60 inches, is light brownish gray light silty clay loam. The soil material below a depth of 44 inches is calcareous.

Permeability is moderate, and the available water capacity is high. Moisture is absorbed easily and released readily to plants.

Hord soils are suited to the cultivated crops commonly grown in the area under dryland and irrigation management. They are also suited to grass, trees, and shrubs; to use as habitat for wildlife; and to recreation uses.

Representative profile of Hord silt loam, 0 to 1 percent slopes, in a cultivated field, 450 feet south and 100 feet west of the northeast corner of sec. 32, T. 4 N., R. 24 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium granular structure; slightly hard, very friable; few worm casts; neutral; abrupt smooth boundary.

A12—8 to 17 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse granular structure; slightly hard, very friable; few worm casts; neutral; clear smooth boundary.

B2—17 to 29 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; few worm casts; neutral; clear smooth boundary.

B3—29 to 39 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; mildly alkaline; gradual smooth boundary.

Ab—39 to 44 inches; grayish brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.

Bb—44 to 48 inches; grayish brown (10YR 5/2) light silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; few white threads of lime; slight effervescence; moderately alkaline; abrupt smooth boundary.

C—48 to 60 inches; light brownish gray (10YR 6/2) light silty clay loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; many white threads of lime and few small lime concretions; strong effervescence; moderately alkaline.

The A horizon is 12 to 18 inches thick. The dark color of this horizon extends into the B horizon to a depth of 22 to 36 inches. The B2 horizon is silt loam or light silty clay loam that is 20 to 35 percent clay. The C horizon is very fine sandy loam and light silty clay loam. Depth to lime ranges from 20 to 55 inches. A buried soil generally is below the solum and above a depth of 60 inches.

Hord soils are near Cozad, Hall, Holdrege, and Uly soils. The upper part of the B horizon in Hord soils is darker than in Cozad, Holdrege, or Uly soils. Hord soils have less clay in the B2 horizon than Hall or Holdrege soils. The depth to lime is greater in Hord soils than in Cozad or Uly soils.

Hr—Hord silt loam, 0 to 1 percent slopes. This soil is on stream terraces of the large valleys. The areas are 20 to about 220 acres in size.

This soil has the profile described as representative of the series. Depth to lime ranges from 15 to 30 inches in some colluvial-alluvial areas that are below the adjacent sloping uplands.

Included with this soil in mapping are small areas of Cozad and Hall soils.

Insufficient moisture is the main limitation when this soil is managed under dryland conditions. Soil blowing is a hazard if the surface is not protected. Runoff is slow. This soil is very friable and easy to work. The organic matter content is moderate, and natural fertility is high. This soil is one of the best in Furnas County for the cultivated crops commonly grown in the area. Tilth is good.

Nearly all of the acreage is cultivated, and a large part is irrigated. Corn and alfalfa are the main irrigated crops. Wheat and grain sorghum are grown under dryland management. Capability units IIc-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

HrB—Hord silt loam, 1 to 3 percent slopes. This soil is on stream terraces. The areas are 5 to about 70 acres in size.

This soil has a profile similar to the one described as representative of the series, except that the subsoil is slightly thinner. Where this soil is adjacent to eroded soils on uplands, the surface layer is slightly thicker. Lime is at a depth of 15 inches in some areas where this soil is adjacent to uplands.

Included with this soil in mapping are small areas of Cozad and Hall soils.

Water erosion is a moderate hazard, especially if this soil is irrigated. Soil blowing is also a hazard if the surface is not protected. Runoff is slow. Land leveling generally is needed for efficient irrigation by the gravity system. Under dryland management, insufficient moisture generally limits production. This soil is easy to work. The organic matter content is moderate, and natural fertility is high. Tilth is good.

Nearly all of the acreage is cultivated. In the Republican River Valley, this soil mainly is irrigated, but in the valleys of small creeks, it is mainly dryfarmed. Corn, alfalfa, grain sorghum, and wheat are the main crops. Capability units IIe-1, dryland, and IIe-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

HrC—Hord silt loam, 3 to 6 percent slopes. This soil is on foot slopes in the uplands and on side slopes in drainageways that cross the stream terraces. The areas are 5 to about 30 acres in size.

This soil has a profile similar to the one described as representative of the series, except that the surface layer is slightly thicker. Sediment that washed from nearby uplands has accumulated on this soil. In some areas this material is calcareous.

Included with this soil in mapping are small areas of Cozad and Hobbs soils.

Water erosion is a severe hazard if the soil is cultivated. Land leveling and reshaping are needed if gravity irrigation is used. Runoff is medium. Under dryland management, insufficient moisture generally limits crop production. The organic matter content is moderate, and natural fertility is medium. Tilth is good.

Most of the acreage is cultivated under dryland management. A small acreage is irrigated. Grain sorghum and wheat are the main dryland crops; alfalfa is a minor crop. Capability units IIIe-1, dryland, and IIIe-6, irrigated; Silty range site; windbreak suitability group 4.

Inavale series

The Inavale series consists of deep, somewhat excessively drained soils that formed in recent sandy and loamy alluvium. These soils are nearly level and gently undulating and are on bottom lands of the Republican River Valley. Low lying areas are subject to occasional flooding. The seasonal high water table is at a depth of about 6 feet in spring.

In a representative profile, the surface layer is very friable, grayish brown loamy fine sand about 5 inches thick. Below that, there is a transitional layer of loose light brownish gray loamy fine sand about 8 inches thick. The underlying material, to a depth of 60 inches, is stratified, light gray and light brownish gray sand, loamy sand, and loamy very fine sand.

Permeability is rapid, and the available water capacity is low. Moisture is absorbed easily and released readily to plants. Inavale soils are droughty.

Inavale soils are only marginally suited to the cultivated crops commonly grown in the area, especially if the crops are grown under dryland management. Most areas have a vegetative cover of grasses or mixed grasses and trees. Inavale soils can also be used for trees and shrubs, as habitat for wildlife, and as recreation areas.

Representative profile of Inavale loamy fine sand, in an area of Inavale soils, 0 to 2 percent slopes, in mixed native grasses and trees, 1,200 feet north and 315 feet east of center of sec. 13, T. 3 N., R. 21 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt wavy boundary.

AC—5 to 13 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grained; loose; moderately alkaline; clear smooth boundary.

C—13 to 60 inches; stratified light gray (10YR 7/2) and light brownish gray (10YR 6/2) sand, loamy sand, and loamy very fine sand, light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) moist; sand and loamy sand strata are single grained, and loamy very fine sand strata are massive; sand and loamy sand strata are loose, and loamy very fine sand strata are soft, very friable; moderately alkaline.

The A horizon is 4 to 10 inches thick. Texture varies but typically ranges from fine sand to loam. An AC horizon of light brownish gray or pale brown loamy sand is in some areas. The C horizon is stratified and has thin layers of material that ranges from sand to loam. Reaction is mildly alkaline or moderately alkaline throughout the profile. Soils in some of the lower lying areas have mottles below a depth of 40 inches.

Inavale soils are near Munjor and McCook soils. They have more sand between depths of 10 and 40 inches than Munjor and McCook soils, and their surface layer is not so thick.

In—Inavale soils, 0 to 2 percent slopes. These soils are on bottom lands of the Republican River Valley. The areas are 10 to 150 acres in size. In many places, they are adjacent to meandering stream channels.

The surface layer is mainly loamy fine sand but ranges from fine sand to loam. The sandy textures generally are in long, narrow, slightly higher areas, and the loamy textures are mainly in lower areas that parallel swales. In some areas the lower part of the profile is 5 to 10 percent gravel.

Included with these soils in mapping are small areas of Munjor soils and a few low areas where the water table is at a depth of 2 to 3 feet in spring. Also included are some narrow ridges that have slopes of as much as 5 percent.

Soil blowing is a very severe hazard if these soils are cultivated. Droughtiness is also a hazard. The organic matter content and natural fertility are low. Fertility, particularly the nitrogen content, needs to be improved and maintained. Runoff is slow. Most rainfall is absorbed immediately. These soils are subject to occasional flooding. Tilth is fair.

Most of the acreage is in native grass used for grazing. A few areas are cultivated, and the main crops are grain sorghum and corn. Many areas are in mixed stands of native grass and woodland. Capability units IVe-5, dryland, and IIIe-11, irrigated; Sandy Lowland range site; windbreak suitability group 3.

McCook series

The McCook series consists of deep, moderately well drained soils that formed in silty and loamy alluvium. The soils are nearly level and are on bottom lands of the Republican River and its larger tributaries. The seasonal high water table is at a depth of about 5 feet in spring.

In a representative profile, the surface layer is very friable, dark grayish brown silt loam about 13 inches thick. Below this is a transitional layer of very friable, pale brown silt loam 7 inches thick. The underlying material, to a depth of 60 inches, is pale brown very fine sandy loam in the upper part, light gray very fine sandy loam in the middle part, and light brownish gray loam in the lower part. The soil material below a depth of 7 inches is calcareous.

Permeability is moderate, and the available water capacity is high. Moisture is absorbed easily and released readily to plants. These soils are subject to rare or occasional flooding. The narrow drainageways are flooded more often than the bottom lands of the Republican River Valley.

McCook soils are suited to cultivated crops under dryland and irrigated management. They are also suited to grass, trees, and shrubs. Many areas provide habitat for wildlife and can be used for recreation.

Representative profile of McCook silt loam, 0 to 2 percent slopes, in a cultivated field, 2,345 feet east and 1,010 feet south of the northwest corner of sec. 31, T. 4 N., R. 22 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.

A12—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; slight effervescence; mildly alkaline; gradual smooth boundary.

AC—13 to 20 inches; pale brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) moist; weak medium granular structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—20 to 40 inches; pale brown (10YR 6/3) very fine sandy loam, grayish brown (10YR 5/2) moist; few thin strata of silt loam; massive; slightly hard, very friable; strong effervescence; moderately alkaline; gradual smooth boundary.

C2—40 to 55 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline; gradual smooth boundary.

C3—55 to 60 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few fine faint brown (7.5YR 4/4) mottles, moist; massive;

slightly hard, very friable; strong effervescence; moderately alkaline.

The A horizon is 10 to 18 inches thick. The C horizon generally is stratified and has lenses and layers of silt loam, loam, and loamy very fine sand. Thin layers of loamy fine sand and silty clay loam are also common. Buried, darkened soils are common in the C horizon.

McCook soils are near Cozad, Gibbon, Hobbs, and Munjor soils. They have less clay and generally less silt in the C horizon than Cozad soils, and unlike Cozad soils they do not have a B horizon. McCook soils are better drained than Gibbon soils. Unlike Hobbs soils, they do not have stratification in the A horizon. They have lime nearer the surface and have less clay than Hobbs soils. McCook soils have more silt and very fine sand between depths of 10 and 40 inches than Munjor soils.

Mc—McCook silt loam, 0 to 2 percent slopes. This is a nearly level soil on bottom lands. The areas are 20 to 250 acres in size.

This soil has the profile described as representative of the series. In a few areas, the surface layer is loam or very fine sandy loam. In places, the upper part of the underlying material is loam or silty clay loam.

Included with this soil in mapping are small areas of Cozad, Munjor, and Gibbon soils. In places, the seasonal high water table is at a depth of 4 feet in spring.

The organic matter content is moderate, and natural fertility is high. Runoff is slow. The surface layer is very friable and easy to till. Soil blowing is a minor hazard if the surface is not adequately protected. This soil is subject to rare or occasional flooding. Soils in the tributary valleys are subject to more flooding than soils in the Republican River Valley. Tilth is good.

Most areas of this soil are cultivated. This soil is well suited to irrigation. The main dryland crops are grain sorghum and some wheat. The main irrigated crops are corn and alfalfa. Capability units I-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

Munjor series

The Munjor series consists of deep, moderately well drained soils that formed in loamy and sandy alluvium. These soils are nearly level and are on bottom lands of the Republican River Valley.

In a representative profile, the surface layer is very friable, grayish brown fine sandy loam 7 inches thick. Below that, there is a transitional layer of very friable, light brownish gray fine sandy loam about 11 inches thick. The underlying material, to a depth of 60 inches, is light gray loamy very fine sand that is stratified with loamy fine sand in the upper part and light gray fine sand in the lower part. The soil material is calcareous throughout.

Permeability is moderately rapid, and the available water capacity is moderate. Moisture is absorbed easily and released readily to plants. These soils are rarely flooded.

Munjor soils are suited to cultivated crops under dryland and irrigation management. They are also suited to grass, trees, and shrubs; to use as habitat for wildlife; and to recreation uses.

Representative profile of Munjor fine sandy loam, 0 to 2 percent slopes, in a cultivated field, 1,200 feet east and 100 feet south of center of sec. 33, R. 4 N., R. 25 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

AC—7 to 18 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse granular structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1—18 to 24 inches; light gray (10YR 7/2) loamy very fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

C2—24 to 29 inches; light gray (10YR 7/2) loamy fine sand, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

C3—29 to 34 inches; light gray (10YR 7/2) loamy very fine sand, light brownish gray (10YR 6/2) moist; massive; soft, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

IIC4—34 to 60 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few fine faint brownish yellow (10YR 6/6) mottles, moist; single grained; loose; slight effervescence; moderately alkaline.

The A horizon is 6 to 14 inches thick. Some profiles do not have AC and IIC horizons. The C horizon is stratified with material that ranges from loamy sand to heavy silt loam. Texture of the IIC horizon ranges from sand to loam. Depth to free carbonates is 0 to 10 inches.

Munjor soils are near Gibbon, McCook, and Inavale soils. Munjor soils have a lighter colored A horizon, are better drained, and have more sand between depths of 10 and 40 inches than Gibbon soils. They have a lighter colored A horizon and a higher content of fine sand and coarser sand between depths of 10 and 40 inches than McCook soils. Munjor soils have less sand between depths of 10 and 40 inches than Inavale soils.

Mu—Munjor fine sandy loam, 0 to 2 percent slopes. This soil is nearly level and is on bottom lands of the Republican River Valley. A few small areas are along Medicine Creek. The seasonal high water table is at a depth of about 5 to 7 feet. Most areas are 15 to 75 acres in size. In some areas, this soil has a surface layer that is darker and thicker than the one described in the representative profile.

Included with this soil in mapping are small areas of Inavale and McCook soils at a higher elevation and areas of Wann Variant soils at a lower elevation.

Soil blowing is a hazard if this soil is cultivated. Insufficient moisture generally limits crop production. The organic matter content is moderately low, and natural fertility is medium. Runoff is slow. The phosphate content is low. Tilth is good.

More than half of the acreage is cultivated, and the rest is in native grass. In many of the cultivated areas, alfalfa and corn are grown under irrigation management. Alfalfa and grain sorghum are the main dryland crops. Capability units IIe-3, dryland, and IIe-8, irrigated; Sandy Lowland range site; windbreak suitability group 3.

Nuckolls series

The Nuckolls series consists of deep, well drained and somewhat excessively drained soils that formed in the silty material of the Loveland Formation. The soils are strongly sloping to steep and are on upland breaks in valleys of tributaries of the Republican River and Beaver and Sappa Creeks.

In a representative profile, the surface layer is very friable, dark grayish brown and grayish brown silt loam 14 inches thick. The subsoil is friable silty clay loam about 14 inches thick. It is grayish brown in the upper part and brown in the middle and lower parts. The underlying material, to a depth of 60 inches, is light yellowish brown silty clay loam. The soil material below a depth of 23 inches is calcareous.

Permeability is moderate, and the available water capacity is high. Moisture is released readily to plants.

Most of the acreage is in native grass. These soils are too steep and the erosion hazard is too severe for the commonly grown cultivated crops. In areas where the slope is less than 15 percent, the soils are suited to trees and shrubs in windbreaks. They are suited to use as habitat for wildlife and to recreation uses.

Nuckolls soils are mapped only in a complex with Coly soils. The map units are described under the Coly series.

Representative profile of Nuckolls silt loam, in an area of Coly-Nuckolls silt loams, 9 to 30 percent slopes, in native range, 100 feet east and 750 feet north of the southwest corner of sec. 18, T. 1 N., R. 23 W.

A11—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; massive; hard, very friable; neutral; abrupt smooth boundary.

A12—4 to 14 inches; grayish brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, very friable; neutral; clear smooth boundary.

B1—14 to 18 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable; neutral; clear smooth boundary.

B2—18 to 23 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine concretions of lime; neutral; gradual smooth boundary.

B3—23 to 28 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; thin coating of lime on faces of peds; slight effervescence; neutral; gradual smooth boundary.

C—28 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, very friable; thin coating of lime on faces of peds; few soft lime accumulations; slight effervescence; mildly alkaline.

The A horizon is 7 to 14 inches thick. The B2 horizon is silt loam or light silty clay loam that is 22 to 32 percent clay. The B and C horizons have hue of 10YR or 7.5YR. Texture of the C horizon ranges from loam to light silty clay loam. Depth to free carbonates is 20 to 36 inches.

In map unit CkE2, the surface layer of the Nuckolls soil is thinner and lighter colored than that defined in the range for the series. These differences do not alter the usefulness or behavior of the soil.

Nuckolls soils are near Uly, Coly, and Canyon soils. They have a stronger brown color than Coly soils, and unlike Coly soils they have a B horizon. Nuckolls soils are deep; they formed in silty, brown (moist) material of the Loveland Formation. Canyon soils are shallow over bedrock. Nuckolls soils have lime that has leached to a greater depth, and they have a stronger brown color in the B and C horizons than Uly soils. Uly soils formed in Peoria loess.

Uly series

The Uly series consists of deep, well drained soils that formed in Peoria loess. These soils are very gently sloping to steep and are on uplands.

In a representative profile, the surface layer is very friable, grayish brown silt loam about 10 inches thick. The subsoil is very friable silt loam 10 inches thick. It is light brownish gray in the upper part and very pale brown in the lower part. The underlying material, to a depth of

60 inches, is very pale brown silt loam. The soil material below a depth of 14 inches is calcareous.

Permeability is moderate, and the available water capacity is high. These soils are highly susceptible to erosion if they are not adequately protected. Moisture is released readily to plants.

Uly soils are suited to cultivated crops under dryland and irrigation management if the slope is not more than 9 percent. The hazard of erosion is too severe for crops if the slope is more than 9 percent. Uly soils are suited to trees and shrubs in windbreaks unless the slope is more than 15 percent. They are suited to grass, to use as habitat for wildlife, and to recreation uses.

Representative profile of Uly silt loam, 3 to 9 percent slopes, in native grass, 300 feet west and 500 feet south of the northeast corner of sec. 34, T. 1 N., R. 24 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; many worm casts; neutral; clear smooth boundary.

A12—7 to 10 inches; grayish brown (10YR 5/2) heavy silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium granular; slightly hard, very friable; many worm casts; neutral; clear smooth boundary.

B2—10 to 14 inches; light brownish gray (10YR 6/2) heavy silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; many worm casts; neutral; clear smooth boundary.

B3—14 to 20 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; lime coatings on faces of peds; strong effervescence; moderately alkaline; clear smooth boundary.

C—20 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline.

The A horizon is 6 to 12 inches thick and is dark grayish brown or grayish brown. The B horizon is 6 to 18 inches thick. In some areas these soils have a B1 horizon. The soil material between depths of 10 and 40 inches is 18 to 25 percent clay. Depth to free carbonates is 8 to 24 inches.

Uly soils are near Hall, Holdrege, and Coly soils. They have a thicker A horizon than Coly soils, and unlike Coly soils they have a B horizon. Uly soils have a thinner A horizon and less clay in the B horizon than Hall soils. They have a thinner B horizon, have less clay in the B horizon, and are deeper to lime than Holdrege soils.

UsB—Uly silt loam, 1 to 3 percent slopes. This is a very gently sloping soil on divides between drainageways in the uplands. Most areas are 10 to 140 acres in size.

This soil has a profile that is similar to the one described as representative of the series, but the surface layer and subsoil are slightly thicker.

Making up 10 to 25 percent of this map unit are soils that have a surface layer that is 12 to 20 inches thick and in which the grayish brown color of the surface layer extends to a depth of 20 to 30 inches.

Included with this soil in mapping are a few small areas of Coly soils at the highest elevations and Holdrege soils at the lowest elevations.

Runoff is slow. The organic matter content is moderately low, and natural fertility is medium. Water erosion is a moderate hazard if this soil is cultivated. This soil is susceptible to soil blowing if the surface is not protected. Leveling generally is needed if gravity irrigation is used. Tilth is good.

In most areas this soil is cultivated, and most of the crops are grown under dryland management. Grain sorghum and wheat are the main crops. Capability units IIe-1, dryland, and IIe-6, irrigated; Silty range site; windbreak suitability group 4.

UsC—Uly silt loam, 3 to 9 percent slopes. This soil is gently sloping and strongly sloping and is mainly on side slopes between the tablelands and the steeper breaks on uplands. Most areas are 5 to 50 acres in size.

This is the soil described as representative of the series. The surface layer is eroded in some places, and it is thinner and ligher in color.

Included with this soil in mapping are small areas of Coly soils in the steepest areas where erosion is most severe and Holdrege soils on the lowest part of some side slopes.

Runoff is medium. The organic matter content is moderately low, and natural fertility is medium. The soil is very friable and easy to work. Water erosion is the main hazard. Insufficient moisture generally limits dryland crop production. Tilth is good.

Most areas of this soil are in native grass. In the remaining areas, wheat and grain sorghum are grown under dryland management. Capability units IVe-1, dryland, and IVe-6, irrigated; Silty range site; windbreak suitability group 4.

Wann Variant

The Wann Variant consists of deep, somewhat poorly drained soils that formed in recent alluvium. The soils are nearly level and are on bottom lands of the Republican River Valley. The Wann Variant soils have a lighter colored surface layer than the Wann soils. The seasonal high water table is at a depth of 3 or 4 feet in most years. It may recede to a depth of about 6 feet late in summer. These soils are occasionally flooded.

In a representative profile, the surface layer is light brownish gray and is about 13 inches thick. It is very friable fine sandy loam in the upper part and very friable loamy very fine sand in the lower part. The underlying material is light gray fine sandy loam. A buried soil is at a depth of 24 inches. Its surface layer is gray very fine sandy loam, and the underlying material, to a depth of about 60 inches, is light gray fine sandy loam, loamy very fine sand, and very fine sandy loam. The soil material is calcareous throughout.

Permeability is moderately rapid, and the available water capacity is high. Moisture is absorbed easily and released readily to plants.

These soils are suited to cultivated crops under dryland and irrigation management. They are also suited to grass, trees, and shrubs; to use as habitat for wildlife; and to recreation uses.

Representative profile of Wann Variant fine sandy loam, 0 to 2 percent slopes, in pasture, 1,245 feet west and 90 feet north of the southeast corner of the NW1/4 sec. 32, T. 4 N., R. 25 W.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; slight effervescence; neutral; gradual smooth boundary.

A12—5 to 13 inches; light brownish gray (10YR 6/2) loamy very fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—13 to 24 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, very friable; thin stratified layers of finer and coarser textured material; slight effervescence; mildly alkaline; abrupt smooth boundary.

A1b—24 to 33 inches; gray (10YR 5/1) very fine sandy loam, very dark gray (10YR 3/1) moist; massive; soft, very friable; slight effervescence; moderately alkaline; gradual smooth boundary.

C2—33 to 42 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; few fine faint yellowish brown (10YR 5/6) mottles, moist; massive; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

C3—42 to 60 inches; light gray (10YR 7/2) stratified loamy very fine sand and very fine sandy loam, grayish brown (10YR 5/2) moist; common fine faint yellowish brown (10YR 5/6) mottles, moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The A horizon is 6 to 15 inches thick. The upper part of the C horizon typically is fine sandy loam, but it ranges to sandy loam, light loam, very fine sandy loam, and loamy very fine sand. The lower part of the C horizon generally is coarser textured than the upper part and ranges to loamy fine sand and loamy sand. The C horizon is stratified with thin to medium layers of soil material. In some areas, medium and coarse sand or sand mixed with gravel is below a depth of 40 inches. Mottles are at a depth of 30 to 45 inches.

Wann Variant soils are near Munjor, McCook, Inavale, and Gibbon soils. They have a lighter colored A horizon and are more poorly drained than Munjor soils. Wann Variant soils have a lighter colored A horizon and have a higher content of fine sand and coarser sand in the upper part of the C horizon than McCook soils. They have less sand between depths of 10 and 40 inches than Inavale soils. They have a lighter colored A horizon and have a higher content of fine sand and coarser sand and a lower content of clay in the upper part of the C horizon than Gibbon soils.

Wb—Wann Variant fine sandy loam, 0 to 2 percent slopes. This is a nearly level soil on bottom lands of the Republican River Valley. Most areas are somewhat elongated and are 15 to 250 acres in size. Most are crossed by poorly defined, shallow channels.

In some small areas, the surface layer is light loam or loamy very fine sand. In a few areas, there are Wann soils, which have a darker colored surface layer than this Wann Variant soil.

Included with this soil in mapping are small areas of the moderately well drained Munjor soils, the sandy Inavale soils, and shallow soils that overlie mixed sand and gravel. Also included are areas of soils that are strongly alkaline and moderately saline and areas where the water table is as high as 2 feet in spring.

The major hazard is wetness that is caused by the water table. Tillage and planting generally are delayed in spring because of the seasonal high water table. This soil warms up more slowly in spring than better drained soils. Soil blowing is a hazard if this soil is cultivated. The water table is lowest in mid and late summer, but in most years crops benefit from subirrigation. The organic matter content and natural fertility are low. Available phosphate content is low. Runoff is slow. Tilth is good.

About three-fourths of the acreage is in cultivated crops, and the rest is in native grass. Alfalfa and grain sorghum are the main dryland crops. Alfalfa and corn are the main irrigated crops. Capability units IIIw-6, dryland, and IIIw-8, irrigated; Subirrigated range site; windbreak suitability group 2.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and windbreaks, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

William E. Reinsch, *conservation agronomist, Soil Conservation Service*, prepared this section.

About 60 percent of the agricultural land in Furnas County is cultivated. According to the Nebraska Agricultural Statistics, the most important crops in 1974 were winter wheat, sorghum, corn, and alfalfa hay. The minor crops were rye, oats, soybeans, barley, and tame hay. Most of the remaining cropland is fallow or is in crop diversion programs.

Managing dryfarmed cropland

Good management practices on dryfarmed cropland reduce runoff and erosion, conserve moisture, and improve tilth. Most of the soils in Furnas County are suitable for crop production. In many places, however, the hazard of erosion is severe and needs to be reduced.

Terraces, contour farming, contour bench leveling, contour furrows, land leveling with terraces, grassed waterways, and a conservation tillage system that keeps crop residue on the surface help to reduce runoff and water erosion. Keeping crop residue on the surface or growing a protective plant cover reduces sealing and crusting of the soil during and after heavy rains. In winter, stubble retains drifting snow that can provide additional moisture.

In Furnas County, maximum crop production is limited by a deficiency of rainfall and by wind and water erosion. To overcome these limitations, a cropping system is needed that is suited to the soils in each field.

A cropping system is the sequence in which crops are grown, in combination with the soil management and conservation practices that are needed. On dryfarmed soils, the cropping system needs to preserve tilth and fertility; maintain a plant cover that protects the soil from erosion; and control weeds, insects, and plant diseases. Cropping systems vary according to the soils on which they are used. For example, the crop sequence on Coly-Uly silt loams, 3 to 9 percent slopes, eroded, should include a high percentage of grass and legume crops. On Holdrege silt loam, 0 to 1 percent slopes, however, a lower percentage of grass and legume crops is needed to maintain the quality of the soil.

For dryland farming, soils should be tilled to prepare a seedbed, to control weeds, and to provide a favorable place for plants to grow. Excessive tillage, however, breaks down the granular structure in the surface layer that is needed for good soil tilth. Only those steps that are essential to the cultivation process should be used. Various methods of conservation tillage are used in Furnas County. The till-plant method is well suited to row crops. Grasses can be established by drilling into a cover of stubble without further seedbed preparation. Wheat generally is planted in the fall on summer-fallowed land utilizing stubble mulch or minimum tillage fallow.

To protect the soils against soil blowing and water erosion during the fallow period and during the initial stage of wheat growth, part of the crop residue should be retained on the surface. The amount of residue needed to protect the soil depends on the kind of residue, the erodibility of the soil, the prevailing wind direction, and the climate.

In addition to protecting the soil against soil blowing and water erosion, crop residue should be retained to provide organic matter that can be returned to the soil. A cropping system should include crops that produce a

good supply of long-lasting residue. Wheat, sorghum, and corn stubble provide good protection for the soil. Proper residue management is needed on all soils, especially on moderately coarse textured soils, such as Munjor fine sandy loam. The removal of crop residue by burning is not desirable.

On sloping soils, level terraces can be constructed across the slope to control water erosion and to conserve moisture. The rainwater absorbed by the soil is useful to crops.

The two main types of level terraces used in Furnas County are conventional terraces, which have a V-shaped channel, and flat terraces, which have a wide flat-bottomed channel. Flat terraces are popular with farmers because they absorb more moisture over a wider area in less time than conventional terraces.

Large grassed terraces, or diversions, are used to divert runoff in large areas. If diversions are used, grassed waterways are needed to dispose of surplus water.

In sandy areas, soil blowing generally is a problem. Stripcropping, or the planting of crops of different heights and kinds in alternating strips, helps to reduce the risk of soil blowing. Stripcropping is more effective if used in combination with stubble mulching. Field windbreaks also help to reduce soil blowing. They can be used alone or in combination with other practices such as stubble mulching or stripcropping.

A few areas in Furnas County are somewhat poorly drained because of a moderately high water table. Open drainage ditches and underground tile systems can be used to help lower the water table if suitable outlets are available. If the water table can not be lowered sufficiently for good crop growth, crops that tolerate wetness can be planted.

Dryfarmed crops do not need so much fertilizer as irrigated crops. Most crops need nitrogen for highest yields. Crops in areas where the soils are limy at the surface benefit from the application of phosphate. Most soils do not need applications of lime because the surface layer is neutral or only slightly acid.

Trace elements of iron, zinc, and magnesium have been used on the soils of Furnas County. Small applications of iron and zinc generally are needed in severely eroded areas. The kind and amount of fertilizer needed should be determined by soil tests, field trials, and crop needs.

Use of herbicides is an excellent method of weed control; however, it is important that the correct kind of herbicide is applied at the proper rate. The colloidal clay and humus fraction of the soil is responsible for the greatest part of chemical activity in the soil. Herbicides can damage crops on sandy soils, which are low in colloidal clay, and on soils that have a moderately low to low organic matter content. Application rates of herbicides should be lowered on these soils.

Managing irrigated cropland

In 1974, the total irrigated acreage in Furnas County was 43,100 acres, according to Nebraska Agricultural Statistics. Corn was the most extensively grown irrigated crop (35,000 acres), followed by alfalfa hay (2,600 acres) and grain sorghum (2,000 acres).

The irrigated areas in Furnas County are in valleys and on uplands where irrigation water is available from deep wells. About 19,000 acres in stream valleys are irrigated by surface water from streams.

The kind of crop grown generally determines the method of irrigation that is used. For example, the method used to irrigate a row crop is generally different from that used to irrigate a close-sown crop or a pasture crop. Furrow irrigation is the most common method of irrigating row crops. The water is applied to furrows between the plant rows by using gated pipe. Furrow irrigation is effective in nearly level to very gently sloping areas. If the furrow slope is 1.5 percent or more, soil erosion is likely to be excessive and other irrigation systems such as sprinklers should be considered.

In the border irrigation method, flooding is controlled by borders or small dikes along the sides of narrow strips in the field. Irrigation water flows as a thin, uniform sheet and is absorbed by the soil as it advances across the strip. Border irrigation is used for close-grown crops such as alfalfa, small grain, and tame grasses. The strips need to be leveled and of uniform grade. Border irrigation is well suited to soils such as Hall silt loam, 0 to 1 percent slopes, and Holdrege silt loam, 1 to 3 percent slopes.

In a sprinkler irrigation system, small sprinklers are spaced along distribution pipes. The sprinklers apply water at a rate that the soil can absorb without runoff. A sprinkler system can be used on the more sloping soils as well as on nearly level soils. A sprinkler system can be used on sandy soils where the intake rate is so high that a furrow system is not practical. Soils such as Wann variant fine sandy loam, 0 to 2 percent slopes, are well suited to the sprinkler method. Because the water can be carefully controlled, sprinkler systems have special uses in conservation farming, such as in establishing new pastures on moderately steep slopes, and in irrigating sandy soils on steep slopes. In summer, however, some water is lost through evaporation, and wind drift can cause an uneven application of water.

A soil can hold only a limited amount of water. Irrigation water, therefore, is applied at intervals that keep the soil moist at all times. The interval varies according to how much water is used by the crop and how much is lost through evaporation. Water should be applied only to the extent that the soil can absorb and retain it. A deep soil, such as McCook silt loam, 0 to 2 percent slopes, holds about 2 inches of available water per foot of soil depth. Thus, soil that is 4 feet deep and planted

to a crop that sends its roots to that depth can hold about 8 inches of available water for that crop.

The best efficiency is obtained if irrigation is begun when half of the stored water has been used by the plants. Thus, if a soil holds 8 inches of available water, irrigation should generally be started when about 4 inches has been used by the plants. The irrigation system should be planned to replace the amount of water that is used by the crop.

Management is needed that controls or regulates the application of water in such a way that good crop growth is obtained without wasting water or eroding the soil. An irrigation re-use system can recycle the runoff water to irrigate the same field or fields nearby. Land leveling can increase irrigation efficiency because the water is evenly distributed.

Irrigated soils generally produce higher yields than dry-farmed soils. More plant nutrients, however, especially nitrogen and phosphorus, are removed when high yields are harvested. Returning crop residue to the soil and adding manure and commercial fertilizers help to supply plant nutrients. An adequate supply of nitrogen should be available to help obtain maximum production. Soils disturbed during land leveling, particularly when topsoil has been removed, generally need applications of nitrogen, phosphorus, zinc, and iron. The kinds and amounts of fertilizers needed for specific irrigated crops should be determined by soil tests.

The main irrigated crops in Furnas County are corn, alfalfa, and sorghums, both grain and forage varieties. A small acreage of pasture grasses is irrigated. The cropping sequence, on soils that are well suited to irrigation, consists mainly of row crops. A change from corn to sorghum or alfalfa helps to control plant disease and insects that commonly are problems when the same crop is grown every year on the same soil. Very gently sloping soils, such as Hord silt loam, 1 to 3 percent slopes, and Holdrege silt loam, 1 to 3 percent slopes, are subject to water erosion if the row crops are planted up and down the hill. Such soils are best suited to a cropping sequence that includes several years of row crops followed by 3 to 5 years of hay and pasture. Close-grown crops, such as alfalfa, or a mixture of alfalfa and grass, can be grown and used for hay. Soils such as Uly silt loam, 3 to 9 percent slopes, and Holdrege silt loam, 3 to 6 percent slopes, eroded, are better suited to irrigated close-sown crops than to irrigated row crops.

Assistance in the planning and layout of an irrigation system is available through the local office of the Soil Conservation Service or the county agricultural agent.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 2. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability unit is identified in the description of each soil map unit in the section "Soil maps for detailed planning." Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

Management by capability units

In this section, the capability units in Furnas County are described. Common features of the soils in each unit are listed, and properties significant to management are given.

The capability units in this survey area are based on the dryland and irrigated systems of management. In the description of the units, the dryland and irrigated crops that grow under each system are given and the hazards and limitations that pertain to the soils under each kind of management are discussed. Practices to overcome the management problems of the soils in each capability unit are also discussed.

The capability unit designated for each soil is given at the end of each detailed map unit description.

All soils in Nebraska are placed in irrigation design groups. These design groups are described in the Irrigation Guide for Nebraska. The Arabic number that is in part of each irrigation capability unit indicates the design group to which the included soils belong. For example, capability unit IIe-6, irrigated, indicates that these soils are in irrigation design group 6 in the Nebraska Irrigation Guide. A copy of the Guide can be available at any local office of the Soil Conservation Service in Nebraska.

Capability unit I-1, dryland

McCook silt loam, 0 to 2 percent slopes, is the only soil in this capability unit. It is a deep, nearly level, moderately well drained soil on bottom lands. The surface layer is silt loam, and the underlying material is loam and very fine sandy loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate, and natural fertility is high. Moisture is absorbed easily and released readily to plants. This soil is easy to work. Runoff is slow.

This soil is well suited to cultivated crops. The main concerns of management are maintaining high fertility and controlling soil blowing. Flooding is rare.

This is one of the best soils in Furnas County for cultivated crops. This soil is suited to all crops commonly grown in the area. Returning crop residue to the soil, applying fertilizer, and other conservation practices are needed in management. Alternating row crops with small grain and hay helps to control disease and insects. Methods of conservation tillage help to control soil blowing, increase the organic matter content, improve the tilth of the surface layer, and increase the water intake rate.

Capability unit IIc-1, dryland

Included in this capability unit are deep, nearly level, well drained soils on uplands and stream terraces. The surface layer and the subsoil are silt loam or silty clay loam.

Permeability is moderate or moderately slow, and the available water capacity is high. The organic matter content is moderate or moderately low, and natural fertility is high. Moisture is absorbed easily and released readily to plants. These soils are easy to work. Runoff is slow.

Rainfall generally is not adequate to meet needs of the crop. The main concerns of management are conserving moisture and controlling soil blowing.

These soils are suited to corn, sorghum, small grain, and alfalfa. Small grains and the first cutting of alfalfa, however, generally are more dependable crops because they grow and mature in spring, when rainfall is highest.

Soil erosion can be reduced and moisture can be conserved by using a cropping system that keeps crop residue on the surface. Close-growing crops, such as alfalfa, help to increase the organic matter content and fertility of the soil and to protect the soil from erosion. A conservation tillage system that keeps crop residue on the surface helps to conserve moisture, increase water intake rate, and reduce the loss of moisture caused by evaporation.

Capability unit IIe-1, dryland

Included in this capability unit are deep, very gently sloping well drained soils on uplands and stream terraces. The surface layer is silt loam, and the subsoil is silt loam or silty clay loam.

Permeability is moderate or moderately slow, and the available water capacity is high. The organic matter content is moderate or moderately low, and natural fertility is medium or high. Moisture is released readily to plants. These soils are easy to till. Runoff is slow or medium, depending on the amount and kind of vegetative cover.

Water erosion is the main hazard if these soils are cultivated. Conserving moisture by reducing runoff is a main concern of management. Soil blowing is a minor hazard. Rainfall generally is not adequate to meet crop needs.

These soils are suited to corn, sorghum, small grain, and alfalfa. Conservation tillage that keeps crop residue

on the surface, terracing, contour farming, and the use of grassed waterways help to control runoff. A cropping system that maintains a vegetative cover on the surface helps to reduce the loss of moisture and improve tilth.

Capability unit IIe-3, dryland

Included in this capability unit are deep, nearly level, well drained and moderately well drained soils on stream terraces and bottom lands. The surface layer is fine sandy loam. The subsoil is fine sandy loam, loamy very fine sand, or loamy fine sand.

Permeability is moderately rapid, and the available water capacity is high or moderate. The organic matter content is moderately low, and natural fertility is medium. Moisture is absorbed easily and released readily to plants. Runoff is slow.

Soil blowing is the main hazard if these soils are cultivated. The organic matter content and fertility of the soils need to be improved. Conserving moisture is important on these moderately coarse textured soils, especially if rainfall is below normal.

These soils are suited to corn, sorghum, small grain, and alfalfa. Water erosion and soil blowing can be reduced and moisture can be conserved by stripcropping, by keeping crop residue on the surface, and by planting grasses or legumes that provide a vegetative cover. If row crops are grown, a conservation tillage system that keeps crop residue on the surface, contour farming, and terraces and grassed waterways are needed.

Capability unit IIe-8, dryland

Holdrege-Coly silt loams, 1 to 3 percent slopes, eroded, is the only map unit in this capability unit. These soils are well drained. The surface layer is silt loam, and the subsoil is silty clay loam or silt loam. The underlying material is silt loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low or very low, and natural fertility is medium or low.

Soil blowing and water erosion are hazards. The organic matter content and fertility of the soils need to be improved. Content of available phosphorus and zinc is low, especially if the soils are severely eroded.

These soils are suited to corn, sorghum, small grain, and alfalfa. Reducing water erosion, improving soil fertility, and conserving moisture are the main concerns of management. Conservation tillage that keeps crop residue on the surface, contour farming, terraces in combination with grassed waterways, and eco-fallow are some of the conservation practices used to control erosion. A cropping system that includes row crops, small grains, and grasses and legumes helps to protect the soil from soil blowing and water erosion, to conserve moisture, and to improve tilth.

Capability unit IIw-3, dryland

Included in this capability unit are deep, nearly level, well drained and moderatly well drained soils on bottom lands. The surface layer is silt loam. The underlying material is silt loam, loam, or very fine sandy loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate, and natural fertility is high.

The main hazard is occasional flooding. This flooding follows spring rains and is generally of short duration. Damage to crops rarely is severe; however, deposits of sediment can delay the planting of crops or damage a young crop. In a dry year, occasional flooding benefits crops if it does not come too rapidly or remain on the soil too long.

These soils are suited to corn, sorghum, small grain, and alfalfa. In most areas, diversions and drainage ditches are needed to intercept runoff. Maintaining diversions and ditches is a concern of management. Ditches should be kept clean. Suitable outlets for runoff are needed. Terraces that divert runoff can be installed on adjacent, higher lying soils to prevent flooding on the soils of this unit. Fertility can be maintained by including legumes in the cropping system and by returning crop residue to the soil.

Capability unit IIw-4, dryland

Gibbon silt loam, 0 to 2 percent slopes, is the only soil in this capability unit. It is a deep, somewhat poorly drained soil on bottom lands. The surface layer is silt loam and silty clay loam. The underlying material is very fine sandy loam, silty clay loam, and loamy fine sand.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate, and natural fertility is medium. Moisture is released readily to plants. The seasonal high water table is at a depth of 2 feet in wet years and 4 feet in dry years. The soil is easy to work when moist, but it dries more slowly than better drained soils. Runoff is slow.

The main limitation of this soil is wetness caused by the moderately high water table. Tillage is delayed in spring, when the water table is highest. In summer, however, the water table can provide moisture that benefits dryfarmed crops. In places, soluble salts accumulate at the surface, but they are washed away by rains. Fertility and the organic matter content need to be maintained. This soil is calcareous, and phosphorus is not readily available. Flooding can occur after heavy rains.

This soil is suited to corn, sorghum, and alfalfa. It is less suited to spring-sown small grain because the water table is high in spring and timely tillage generally is not possible. Diversions, drainage ditches, and tile drains help to control wetness. Alfalfa and grasses in the cropping system help to maintain fertility, tilth, and the organic matter content.

Capability unit IIIe-1, dryland

Included in this capability unit are deep, gently sloping, well drained soils on uplands and stream terraces. The

surface layer is silt loam, and the subsoil is silt loam or silty clay loam. In a few areas, the soils are moderately eroded.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate or moderately low, and natural fertility is high. Moisture is released readily to plants. These soils are friable and easy to work. Runoff is medium.

Water erosion is the main hazard if these soils are used for crops. Conserving moisture by preventing runoff is the main concern of management. Soil blowing is a minor hazard. The organic matter content needs to be improved, particularly if the soils are eroded. Rainfall generally is inadequate to meet crop needs.

These soils are well suited to corn, sorghum, small grain, and alfalfa. Crops are subject to damage late in summer because rainfall generally is limited. Terraces, grassed waterways, contour farming, conservation tillage that leaves crop residue on the surface, and a system of fallow help to reduce the rate of runoff and the hazard of erosion. Water erosion and soil blowing can be reduced and moisture can be conserved by using a cropping system that maintains a surface cover of crops or crop residue. Vegetative practices, such as a cropping system that limits row crops to 1 or 2 years in succession or one that uses wheat, row crops, and fallow, are effective in controlling erosion. A conservation tillage system that leaves crop residue on the surface is also effective in controlling erosion. Gullied areas can be shaped and seeded to grass. Grassed field borders help control runoff and can be used as turnrows, roadways, or for wildlife habitat.

Capability unit IIIe-8, dryland

Holdrege-Coly silt loams, 3 to 6 percent slopes, eroded, is the only map unit in this capability unit. This map unit consists of deep, gently sloping, well drained soils on uplands. The surface layer is silt loam. The subsoil is silt loam or silty clay loam. The underlying material is silt loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low or very low, and natural fertility is medium or low. Moisture is released readily to plants. These soils are friable and fairly easy to work. Runoff is medium.

Controlling water erosion and maintaining soil fertility are the main concerns of management. The organic matter content should be increased to improve the water intake rate. Fertility can be improved by applying nitrogen, phosphate, and possibly zinc. Conserving all available moisture is important because rainfall generally is inadequate to meet crop needs. Crops are subject to damage late in summer because rainfall generally is limited.

These soils are well suited to corn, sorghum, small grain, and alfalfa. Terraces, grassed waterways, contour farming, and conservation tillage that leaves crop residue on the surface can help to reduce runoff and erosion. Water erosion can be reduced and moisture can be conserved by using a cropping system that maintains a surface cover of crops or crop residue. Vegetative practices, such as a cropping system that limits row crops to 1 or 2 years in succession or one that uses wheat, row crops, and fallow, are effective in controlling erosion. A conservation tillage system that leaves crop residue on the surface is also effective in controlling erosion. Gullied areas can be shaped and seeded to grass. Grassed field borders help control runoff and can be used as turnrows, roadways, or for wildlife habitat.

Capability unit IIIw-2, dryland

Fillmore silty clay loam, 0 to 1 percent slopes, is the only soil in this capability unit. It is a deep, nearly level, poorly drained soil in depressions on stream terraces. The surface layer is silty clay loam. The subsoil is silty clay and silty clay loam. These soils are occasionally flooded by water from higher elevations.

Permeability is very slow, and the available water capacity is high. The organic matter content is moderately low, and natural fertility is medium. Moisture is absorbed slowly and released slowly to plants. Runoff is ponded unless the areas are artificially drained.

Flooding is the main hazard. The areas generally are flooded each year following spring rains. Wetness delays tillage and retards crop growth, but a complete crop loss is not common. In midsummer, when rainfall is lowest, this soil can be droughty and tends to crack, causing the lower horizons to become dry. Soil blowing can occur if the surface is not adequately protected.

This soil is suited to row crops, small grain, and alfalfa. It is poorly suited to spring-seeded small grain and alfalfa because the flood hazard is highest in spring. The use of terraces and diversions on adjacent, higher lying soils helps to prevent excess runoff from flooding this soil. Drainage ditches help to remove excess surface water so that tillage is not delayed. Using tillage methods that keep crop residue on the surface protects the soil from soil blowing during periods of drought.

Capability unit IIIw-6, dryland

Wann Variant fine sandy loam, 0 to 2 percent slopes, is the only soil in this capability unit. It is a deep, nearly level, somewhat poorly drained soil on bottom lands. The surface layer is fine sandy loam and loamy very fine sand. The underlying material is fine sandy loam, loamy very fine sand, and very fine sandy loam.

Permeability is moderately rapid, and the available water capacity is high. The organic matter content and natural fertility are low. Moisture is absorbed easily and released readily to plants. This soil is easy to work. Runoff is slow.

The sediment deposited by floodwaters can damage young plants. The water table delays planting in spring. In midsummer, when the water table and rainfall are lowest, this soil can be droughty. The organic matter

content needs to be increased. Soil blowing is a hazard early in fall if the soil is not adequately protected.

This soil is suited to row crops, small grain, and alfalfa. It is not well suited to spring-seeded small grain because the water table is highest in spring. In areas where the water table is extremely high, this soil is not suited to alfalfa. A close-growing crop eliminates the need for working this soil in spring and protects the soil from soil blowing when the surface is dry. Keeping crop residue on the surface helps to improve the organic matter content and reduce erosion.

Capability unit IVe-1, dryland

Uly silt loam, 3 to 9 percent slopes, is the only soil in this capability unit. This is a deep, well drained, gently sloping to strongly sloping soil on uplands. The surface layer, subsoil, and underlying material are silt loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low, and natural fertility is medium. Moisture is released readily to plants. This soil is easy to work because the surface layer is friable. Runoff is medium.

The hazard of water erosion and poor fertility are the main limitations if this soil is used for crops. In places, rills and small gullies are plowed in during tillage. There generally is a shortage of rainfall in summer; therefore, conserving all available moisture is important. Soil blowing is a hazard if the surface is not adequately protected. The organic matter content needs to be improved.

This soil is not well suited to row crops because runoff following rains causes moisture loss and severe water erosion. It is better suited to small grain, grasses, and alfalfa. This soil can be seeded to native grass. Terraces, grassed waterways, contour farming, and tillage that leaves crop residue on the surface help to reduce runoff and erosion. A good cropping system includes small grain, grasses, alfalfa, and a limited number of row crops. Vegetative practices, such as conservation tillage; a good cropping system that includes grasses and alfalfa; and mechanical practices, such as the use of terraces and grassed waterways, are needed if the soil is cultivated. Grassed field borders help to control runoff at the end of the field. They can be used as turnrows, roadways, and wildlife habitat.

Capability unit IVe-5, dryland

Inavale soils, 0 to 2 percent slopes, is the only map unit in this capability unit. This map unit consists of deep, nearly level, somewhat excessively drained soils. The surface layer is loam, fine sandy loam, loamy fine sand, or sand. The underlying material is sand, loamy sand, and loamy very fine sand.

Permeability is rapid, and the available water capacity is low. The organic matter content and natural fertility are low. Moisture is absorbed rapidly and released readily to plants. These soils are loose when dry and are somewhat difficult to work. Tilth is poor. Runoff is slow.

Soil blowing is a severe hazard if these soils are cultivated. Because of the low available water capacity and loss of moisture through leaching, these soils are droughty. Rainfall generally is inadequate to meet the moisture requirement of crops. The organic matter content and fertility need to be improved.

These soils are suited to corn, sorghum, small grain, and alfalfa. They generally are best suited to small grain and the first cutting of alfalfa because these crops grow and mature in spring, when rainfall is plentiful. Row crops can be planted if they are included in a cropping system that keeps crop residue on the surface. Starting crops on this soil can be difficult because soil blowing destroys many of the young plants early in spring. Soil blowing can be reduced, moisture can be conserved, and the organic matter content and fertility can be maintained by using a cropping system that maintains a surface cover of crops, grasses, or crop residue. Soil blowing can also be reduced by the use of stripcropping, conservation tillage, grassed field borders, and narrow or one-row tree windbreaks.

Capability unit IVe-9, dryland

Coly-Uly silt loams, 3 to 9 percent slopes, eroded, is the only map unit in this capability unit. This map unit consists of deep, gently sloping and strongly sloping, well drained soils on uplands. The surface layer, subsoil, and underlying material are silt loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is low or very low, and natural fertility is medium or low. Moisture is absorbed easily and released readily to plants. However, much of the rainfall is lost by runoff. These soils are somewhat difficult to work. Runoff is medium or rapid, depending on the kind and amount of vegetative cover.

Water erosion and soil blowing are severe hazards. Small rills and gullies are common. Conserving the available moisture is important in managing these soils. The organic matter content and fertility need to be improved. Available phosphorus, nitrogen, and zinc generally are deficient. Rainfall generally is inadequate to meet the needs of crops.

These soils are marginally suited to corn and sorghum and are better suited to small grain and alfalfa. Crops are subject to stress or damage in most summers because of the limited rainfall. Vegetative practices, such as grassed waterways and conservation tillage that leaves crop residue on the surface, are needed to control runoff and erosion (fig. 11). Terraces and contour farming also are beneficial.

Water erosion can be reduced and moisture can be conserved by using a cropping sequence that keeps crop residue on the surface. The best results are obtained by limiting the use of row crops to 1 year and by using mainly grasses, wheat, or alfalfa in the cropping system. These soils can be reseeded to native grass.

Capability unit IVs-1, dryland

Gibbon silt loam, saline, 0 to 2 percent slopes, is the only soil in this capability unit. It is a deep, nearly level, somewhat poorly drained soil on bottom lands. It is moderately to strongly affected by salts and alkalinity. The surface layer is silt loam and silty clay loam. The underlying material is very fine sandy loam, silty clay loam, and loamy fine sand.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low, and natural fertility is low. Moisture is absorbed slowly and released slowly to plants. The seasonal high water table is at a depth of 2 feet. This soil is difficult to work because the surface crusts when the soil is dry and the soil is puddled when it is wet. Local flooding can occur after heavy rains. Runoff is slow.

Salinity and alkalinity are the main limitations. The content of available plant nutrients and the organic matter content need to be increased. The content of nitrogen and available phosphorus is low. Tilth needs to be improved. Wetness in spring delays tillage.

This soil is not well suited to cultivated crops because of the salinity. Corn, sorghum, small grain, alfalfa, and saline-tolerant grasses can be grown, but small grain and the first cutting of alfalfa generally are the best crops because they grow and mature in spring, when rainfall is more frequent.

Good management is needed in cultivated areas because of slick spots that are droughty, have poor tilth and slow permeability, and have salts that are toxic to some crops. Because of poor soil structure and slow permeability, runoff is increased. Chemicals can be added to the soil to reduce the effect of salinity. The best results generally are obtained by growing salt-tolerant crops and by using a cropping system that maintains a vegetative cover, which can help to prevent crusting and evaporation.

Capability unit Vw-7, dryland

Barney soils, 0 to 2 percent slopes, is the only map unit in this capability unit. The soils are nearly level, very poorly drained, and shallow over mixed sand and gravel. The surface layer ranges from very fine sandy loam to silty clay. The underlying material is loamy fine sand and sand that contains some gravel.

Permeability is rapid in the upper part of the underlying material and very rapid in the lower part. The available water capacity is low. The organic matter content is moderately low, and natural fertility is low. The water table is at the surface in wet years and at a depth of about 3 feet in dry years. Runoff is very slow or ponded.

Because of the high water table, these soils are too wet for cultivated crops. They can become boggy if used for range when the water table is highest. Suitable outlets for drainage generally are not available.

Nearly all of the acreage is used for permanent hay or pasture. Proper stocking and deferred grazing help maintain and increase grass production and help prevent areas from becoming boggy. Boggy conditions develop in pastures that are grazed when the water table is at or near the surface.

Many areas adjacent to the Republican River are densely wooded. It is possible to increase grass production in these areas by introducing reed canarygrass or other grasses that can tolerate excessive wetness. These areas are also suitable for use as wildlife habitat.

Capability unit VIe-1, dryland

Campus-Canyon loams, 9 to 30 percent slopes, is the only map unit in this capability unit. This map unit consists of moderately steep or steep, well drained soils on uplands. These soils are moderately deep and shallow and overlie fine-grained sandstone. The surface layer and underlying material are loam and clay loam. Lime is at or near the surface.

Permeability is moderate, and the available water capacity is very low to moderate. The organic matter content is low or moderately low, and natural fertility is low or medium. Moisture is released readily to plants. Runoff is rapid.

Water erosion is a very severe hazard. These soils are too steep for cultivated crops and for other less intensive uses. Conserving moisture is important because runoff is excessive and because there generally is a shortage of rainfall in summer. Soil blowing can be a hazard if the surface is not adequately protected. Proper grazing use helps keep the grasses healthy and productive.

Capability unit VIe-9, dryland

Included in this capability unit are deep, moderately steep and steep, well drained and somewhat excessively drained soils on uplands. The surface layer is silt loam. The subsoil and underlying material are silt loam or silty clay loam. In a few areas, these soils are eroded.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low to very low, and natural fertility is medium or low. Moisture is released readily to plants. Runoff is rapid.

Water erosion is a severe hazard. These soils are too steep and too erodible for the cultivated crops commonly grown in the area. Slowing runoff helps conserve the available moisture. Gullies are along the side slopes or at the head of drainageways in some areas.

Most of the acreage is in native grass and is used for grazing or hay production. Proper grazing use, a planned grazing system, and control of weeds and brush are needed to maintain and improve the condition of the range. In cultivated areas the soils generally are severely eroded. They can be retired from cultivation, seeded to native grass, and converted to range for grazing. These soils also are suited to use as habitat for wildlife and to recreation uses. Dams for livestock water (fig. 12), erosion-control structures, and flood-prevention reservoirs

can be constructed on the bottom of some drainageways.

Capability unit VIw-7, dryland

Hobbs silt loam, channeled, 0 to 2 percent slopes, is the only soil in this capability unit. This is a deep, nearly level, well drained soil on narrow bottom lands. A channel meanders through most areas of this soil. Most areas are bordered by steep slopes of the adjacent uplands. This soil is frequently flooded. It is silt loam throughout.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate, and natural fertility is high. Moisture is absorbed easily and released readily to plants. Runoff is slow.

Wetness caused by frequent flooding is the main limitation of this soil. The areas are flooded nearly every year, mainly in spring.

This soil is not suited to the cultivated crops commonly grown in the area because flooding is too frequent for timely tillage and for crops to grow and mature. Some areas are not easily accessible because of the entrenched channel. Sediment and debris are common after the floodwaters recede. Most areas are used as permanent range. This soil is also suited to native woodland, to use as habitat for wildlife, and to recreation uses.

Capability unit VIIe-9, dryland

Coly silt loam, 30 to 60 percent slopes, is the only soil in this capability unit. This is a deep, very steep, somewhat excessively drained soil on side slopes and blufflike areas of the loess uplands. The surface layer and underlying material are silt loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is very low, and natural fertility is low. Moisture is released readily to plants. Runoff is very rapid.

This soil is too steep for successful cultivation. Water erosion, caused by very rapid runoff from steep slopes, and soil blowing are very severe hazards. Gullies are common at the head of canyons.

This soil is not suitable for the cultivated crops commonly grown in the area because it it too steep and erodible. It is suited to grass, to use as habitat for wildlife, and to recreation uses. Most areas are used as permanent range. A good cover of grass and a planned grazing system reduce water erosion and conserve moisture on the very steep slopes. Dams for livestock water impoundment and erosion-control structures can be built on the bottom of some drainageways.

Capability unit I-4, irrigated

Included in this capability unit are deep, nearly level, well drained soils on uplands and stream terraces. The surface layer is silt loam and silty clay loam. The subsoil is silty clay loam.

Permeability is moderately slow or moderate, and the available water capacity is high. The organic matter content is moderate, and natural fertility is high. Moisture is released readily to plants. These soils are easy to work. The water intake rate is moderately low. Runoff is slow.

These soils have few limitations if they are irrigated. The main concern is maintaining a high level of fertility. Tailwater and runoff from excessive rainfall can be a problem. Soil blowing is a minor hazard if the surface is not adequately protected.

These soils are suited to irrigated row crops and alfalfa. In most areas, leveling is needed if gravity irrigation is used. An efficient irrigation system, uniform distribution of water, and measures to control the irrigation water are needed.

Capability unit I-6, irrigated

Included in this capability unit are deep, nearly level, well drained or moderately well drained soils on stream terraces and bottom lands. The surface layer and subsoil are silt loam. The underlying material is silty clay loam and very fine sandy loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate or moderately low, and natural fertility is high. Moisture is released readily to plants. These soils have a moderate intake rate. They are easy to work. Runoff is slow.

These soils have few limitations if they are irrigated. The high level of fertility and the high organic matter content need to be maintained. Soil blowing is a minor hazard if the surface is not adequately protected.

These soils are suited to all the common irrigation systems (fig. 13). They are suited to row crops, alfalfa, and introduced grasses for hay and pasture. In most areas, slight irregularities in the land surface can cause uneven distribution of irrigation water; therefore, leveling is needed to prepare the soils if gravity irrigation is used. Crop residue left on the surface in winter helps to control soil blowing.

Production can be sustained by using fertilizer, providing enough seeds for a high plant population, a conservation tillage method that keeps most of the crop residue on the surface, and an irrigation management system that controls the amount and time of application. Uniform distribution of irrigation water and measures to control the amount of irrigation water used are needed.

Capability unit IIe-4, irrigated

Included in this capability unit are deep, very gently sloping, well drained soils on uplands. The surface layer is silt loam. The subsoil is silty clay loam or silt loam. The underlying material is silt loam. In a few areas the soils are eroded.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low or very low, and natural fertility is medium or low. These soils have a moderately low water intake rate. Moisture is released readily to plants. Tilth is good, and the soils are easy to work.

Water erosion is the main hazard if these soils are irrigated. Soil blowing is a minor hazard if the surface is bare. Runoff caused by excessive rainfall can be a problem. Carryover of herbicides also can be a problem, especially in areas of eroded soils that have a low organic matter content. Maintaining fertility is a major concern of management.

These soils are suited to row crops, alfalfa, and introduced grasses. They are suited to either gravity or sprinkler irrigation. For furrow irrigation, land leveling almost always is needed. In a gravity irrigation system, contour bench leveling and contour furrow leveling with terraces are needed to insure the efficient distribution of water and to protect the soils against water erosion. A conservation tillage method that leaves crop residue on the surface is effective in reducing water erosion and soil blowing. Control of irrigation runoff at the end of fields generally is needed.

Capability unit IIe-6, irrigated

Included in this capability unit are deep, very gently sloping, well drained soils on stream terraces and uplands. The surface layer, subsoil, and underlying material are silt loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate or moderately low, and natural fertility is high or medium. The water intake rate is moderate. Moisture is released readily to plants. These soils are easy to work. Runoff is slow.

Water erosion and soil blowing are the main hazards. Maintaining fertility and increasing the organic matter content are important.

Row crops, alfalfa, and grasses are suitable crops under irrigation. Land leveling helps to insure the uniform distribution of water if a gravity irrigation system is used. Leveling for contour furrows with terraces and for contour benches helps to control erosion under a gravity irrigation system. These soils are also suited to sprinkler irrigation. A conservation tillage method that keeps crop residue on the surface is effective in controlling soil blowing and water erosion. Irrigation runoff at the end of fields should be reduced and controlled. The use of barnyard manure helps to improve tilth and fertility.

Capability unit IIe-8, irrigated

Included in this capability unit are deep, nearly level, well drained and moderately well drained soils on stream terraces and bottom lands. The surface layer and subsoil are fine sandy loam. The underlying material is fine sandy loam and loamy very fine sand.

Permeability is moderately rapid, and the available water capacity is high or moderate. The organic matter content is moderately low, and natural fertility is medium. The water intake rate is moderately high. Moisture is released readily to plants.

Soil blowing is a moderate hazard. These soils are droughty if irrigation is not timely. The organic matter content needs to be increased. The content of nitrogen and phosphorus generally is low. Fertility can be reduced by leaching if an excessive amount of irrigation water is applied.

These soils are suited to row crops, small grain, grasses, and alfalfa. The organic matter content can be maintained by including small grains and grasses and legumes in the cropping system and by leaving crop residue on the surface. These soils are suited to furrow and sprinkler irrigation systems. Land leveling generally is needed for furrow irrigation if water is to be used efficiently. A conservation tillage system that keeps crop residue on the surface can be used to control soil blowing and water erosion. The use of barnyard manure helps to maintain fertility and to improve the capacity of these soils to hold water.

Capability unit IIw-6, irrigated

Included in this capabilty unit are deep, nearly level, well drained, moderately well drained, and somewhat poorly drained soils. The surface layer is silt loam and silty clay loam. The underlying material is mainly silt loam, silty clay loam, and very fine sandy loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate, and natural fertility is medium or high. The water intake rate is moderate. Moisture is released readily to plants. The seasonal high water table is at a depth of 2 or 3 feet. These soils are occasionally flooded, but flooding is brief. These soils are easy to till, except when they are too wet.

The main hazard is wetness, which is caused by the high water table in some areas and by occasional flooding in other areas. Wetness generally delays tillage and planting in spring. Crops are occasionally damaged by flooding, but a total loss of crops is not common.

These soils are suited to irrigated row crops and to irrigated cool-season grasses introduced for hay and pasture. They are suited to sprinkler or gravity irrigation systems. Land leveling generally is needed if a gravity irrigation system is used. Leveling improves surface drainage and the efficiency of water application. The use of grasses in the cropping system helps to improve the organic matter content. In some areas, drainage ditches or tile drains can be used to lower the water table so that tillage in spring is more timely.

Capability unit IIIe-4, irrigated

Included in this capability unit are deep, gently sloping, well drained soils on uplands. The surface layer is silt loam. The subsoil is silty clay loam or silt loam. The underlying material is silt loam. In most areas, the soils are moderately or severely eroded.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate to very low, and natural fertility is high to low. The water intake rate is moderately low. These soils are easy to

work, except where the subsoil is exposed. Runoff is medium.

Water erosion is the main hazard, and it can cause small gullies and rills to form. Irrigation water should be managed to prevent erosion. In areas of light colored soils, the organic matter content should be increased, and herbicides should be carefully applied to prevent carryover.

These soils are suited to row crops, alfalfa, and introduced cool-season grasses. Terraces, contour furrow irrigation, grassed waterways, and contour bench irrigation can help to control water erosion. A sprinkler system can be used if erosion is controlled. A system of conservation tillage that keeps crop residue on the surface can help to control water erosion and soil blowing.

Capability unit IIIe-6, irrigated

Included in this capability unit are deep, gently sloping, well drained soils on stream terraces. The surface layer and subsoil are silt loam. The underlying material is silt loam, silty clay loam, and very fine sandy loam.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderate or moderately low, and natural fertility is high. The water intake rate is moderate. Moisture is released readily to plants. These soils are easy to till. Runoff is medium.

Because of slope, water erosion is a hazard when these soils are irrigated. The organic matter content needs to be increased. Soil blowing is a minor hazard. Irrigation water should be managed to prevent erosion.

These soils are suited to irrigated row crops, alfalfa, and grasses. Because of the hazard of water erosion, row crops should be irrigated only if erosion-control practices such as terraces, contour furrow leveling, contour furrow irrigation with terraces, waterways, and conservation tillage are used. Sprinkler irrigation is suitable for row crops if erosion is controlled. A conservation tillage system that keeps crop residue on the surface should be used.

Capability unit IIIe-11, irrigated

Inavale soils, 0 to 2 percent slopes, is the only map unit in this capability unit. This map unit consists of deep, nearly level, somewhat excessively drained soils on bottom lands. The surface layer is loam, fine sandy loam, loamy fine sand, or fine sand. The underlying material is loamy very fine sand, loamy sand, and sand.

Permeabiliy is rapid, and the available water capacity is low. The organic matter content and natural fertility are low. These soils have a very high water intake rate. Moisture is released readily to plants. These soils generally are somewhat difficult to work. Runoff is slow, and most of the moisture is absorbed by the soil.

Soil blowing is the main hazard. These soils are droughty because they dry out easily and lose some moisture by leaching. The organic matter content needs to be improved. These soils are deficient in fertility, mainly in nitrogen and phosphorus. Leaching can occur if an excessive amount of water is applied.

These soils are suited to row crops, alfalfa, grass for hay and pasture, and small grain. A sprinkler system can be used to irrigate these soils. It may be a more practical system than a gravity system because of the rapid permeability of these soils. Water should be applied frequently and in small amounts. A conservation tillage system that keeps crop residue on the surface is effective in controlling soil blowing.

Capability unit IIIs-6, irrigated

Gibbon silt loam, saline, 0 to 2 percent slopes, is the only soil in this capability unit. This is a deep, nearly level, somewhat poorly drained soil on bottom lands. The surface layer is silt loam and silty clay loam. The underlying material is very fine sandy loam, silty clay loam, and loamy fine sand.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low, and natural fertility is low. This soil has a moderate water intake rate. Moisture is released slowly to plants. The seasonal high water table is at a depth of 2 feet in wet years and 3 feet in dry years. The soil is difficult to work because it becomes crusted when dry and may be puddled when wet. Runoff is slow. This soil is moderately to strongly affected by excess salts and alkalinity.

The saline and alkali condition is the main limitation. This soil generally is too wet in spring for timely tillage. Content of available phosphorus generally is low. Flooding is common but brief.

If irrigated, this soil is suited to row crops, alfalfa, cool-season grasses for hay and pasture, and small grain. Land leveling improves surface drainage so that furrow irrigation can be used. Returning crop residue to the soil helps to improve and maintain the organic matter content and tilth. In areas where the water table is highest, drainage can be provided by drainage ditches or tile drains. Chemicals can be used to reduce the effects of salts and alkali on crops. Additions of phosphate fertilizer are needed to increase the content of available phosphorus.

Capability unit IIIw-1, irrigated

Fillmore silty clay loam, 0 to 1 percent slopes, is the only soil in this capability unit. This is a deep, nearly level, poorly drained soil in depressions. The surface layer is silty clay loam. The subsoil is silty clay and silty clay loam. The underlying material is silty clay loam.

Permeability is very slow, and the available water capacity is high. The organic matter content is moderately low, and natural fertility is medium. The water intake rate is low. Moisture is released slowly to plants. This soil is somewhat difficult to work because it generally is too wet. Runoff is slow or ponded in the lowest areas. This soil is occasionally flooded.

Wetness caused by occasional flooding is the main hazard. The lowest parts of some areas are ponded

following rains or because of excess water from irrigation. Spring tillage generally is delayed. The ponded water is shallow and generally remains for only a short time. Soil blowing can be a hazard if the soil is bare.

If irrigated, this soil is suited to row crops, alfalfa, grass for hay or pasture, and small grain. Land leveling improves surface drainage so that furrow irrigation can be used. Returning crop residue to the soil helps to maintain and improve the organic matter content and tilth. Diversions and terraces can be constructed on the adjacent, higher soils to help prevent excess water from inundating the areas.

Capability unit IIIw-8, irrigated

Wann Variant fine sandy loam, 0 to 2 percent slopes, is the only soil in this capability unit. This is a deep, nearly level, somewhat poorly drained soil on bottom lands. The surface layer is fine sandy loam and loamy very fine sand. The underlying material is fine sandy loam, very fine sandy loam, and loamy very fine sand.

Permeability is moderately rapid, and the available water capacity is high. The organic matter content and natural fertility are low. The water intake rate is moderately high. Moisture is released readily to plants. The seasonal high water table is at a depth of about 3 feet in wet years and 4 feet in dry years.

Wetness from the water table commonly delays tillage in spring, but in dry years it benefits the crops. This soil is susceptible to rare flooding. It is low in nitrogen and in available phosphorus. The organic matter content needs to be increased. Plant nutrients can be leached to a depth below the crop roots if the amount of irrigation water is excessive. Herbicides should be applied carefully to prevent carryover.

If irrigated, this soil is suited to row crops, small grain, and grasses for hay or pasture. This soil is suited to all common irrigation systems. Slight irregularities in the land surface can make the uniform distribution of irrigation water difficult. In most places, land leveling is needed to prepare the soil if a gravity irrigation system is used. Leaving crop residue on the surface in winter helps to control soil blowing. Nitrate and phosphate fertilizers are needed to help maintain a high level of fertility.

Capability unit IVe-6, irrigated

Included in this capability unit are deep, gently sloping and strongly sloping, well drained soils on uplands. The surface layer, subsoil, and underlying material are silt loam. In many areas, the soils are severely eroded.

Permeability is moderate, and the available water capacity is high. The organic matter content is moderately low to very low, and natural fertility is medium or low. The water intake rate is moderate. Runoff is medium or rapid, depending on the intensity of rainfall and on the kind and amount of plant cover. Moisture is released readily to plants.

Water erosion is the main hazard. Management of the irrigation water is a major concern. The level of fertility and the organic matter content need to be improved. The carryover of herbicides is a possible hazard in areas of light colored soils. Soil blowing is a hazard in fall. Phosphorus is not readily available where the surface layer is calcareous.

Row crops need intensive conservation practices because of the hazard of erosion. Terraces, grassed waterways, contour furrows, and contour bench leveling generally are needed. A conservation tillage system that keeps crop residue on the surface helps to control erosion. A cropping system that includes grasses and close-growing crops helps to maintain the organic matter content and to improve tilth. These soils are suited to sprinkler irrigation if erosion is controlled.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 3. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the soil is not suited to the crop or the crop is not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 3.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely

to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 3 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Management of the soils for range

Peter N. Jensen, range conservationist, Soil Conservation Service, prepared this section.

Rangeland makes up about 37 percent of the total agricultural acreage in Furnas County. It is scattered throughout the county, but most of the rangeland is in areas of the strongly sloping to very steep soils along the breaks of the Republican River Valley and the narrower valleys of Beaver and Sappa Creeks. The major soil association in range is the Coly-Uly-Holdrege association.

Livestock is the second largest agricultural industry in the county. It consists mainly of cow and calf herds; the calves are sold in the fall as feeders. Range generally is grazed from late in spring to early in fall. The livestock graze grain sorghum or corn aftermath in the fall and early in winter and are fed hay or silage, or both, for the rest of winter.

Management and improvement practices

Management practices that maintain or improve the range condition are needed on all rangeland. They include proper grazing use, deferred grazing, and planned grazing systems. The correct placement of fences, livestock watering developments, and salting facilities in a pasture can insure the proper distribution of livestock.

Range condition can be improved by range seeding, which is the establishment, by seeding or reseeding, of native grasses, either wild-harvest or improved strains. Soils such as Coly silt loam, 9 to 15 percent slopes, eroded, and Coly-Nuckolls silt loams, 9 to 15 percent slopes, eroded, that are still being used as cropland should be seeded to range. The most important grasses used in the seed mixture include big bluestem, little bluestem, indiangrass, switchgrass, sideoats grama, and blue grama. Good forage production can be maintained on these soils by the proper management of grazing.

Range sites and condition classes

The soils in Furnas County that are suitable for use as range have been grouped into range sites. A range site is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce characteristic climax, or original, vegetation. Climax vegetation is the combination of plants that originally grew on a given site, and it generally is the most productive combination of range plants on a site. Each range site may need different management.

Intensive grazing can alter the climax vegetation on a site. By constantly grazing the more palatable and nutritious plants, livestock can cause range plants to decrease, increase, or invade. Plants that decrease or increase are climax plants. Generally, *decreasers* are the most heavily grazed plants and, consequently, they are the first to be injured by overgrazing. *Increasers* withstand grazing better or are less palatable to livestock. They increase under grazing and replace the decreasers. *Invaders* are weeds that become established after the climax vegetation has been reduced by grazing.

Range condition is classified according to the percentage of the original, or climax, vegetation on the site. This classification is used to compare the present kind and amount of vegetation on a site with the kind and amount which the site has the potential to produce. Range condition changes mainly because of changes in the intensity of grazing and because of drought. There are four range condition classes. The condition is *excellent* if 76 to 100 percent of the vegetation is climax; *good* if 51 to 75 percent is climax; *fair* if 26 to 50 percent is climax; and *poor* if 0 to 25 percent is climax.

Description of range sites

The range sites in Furnas County are Wet Land, Subirrigated, Silty Overflow, Clayey Overflow, Silty Lowland, Sandy Lowland, Silty, Sandy, Limy Upland, Shallow Limy, and Thin Loess. These sites are described in the following paragraphs. Each description includes information about the topography of each site, the soils on each site, the dominant vegetation when the site is in excellent condition, and the dominant vegetation when the site is in poor range condition. Each range site description also gives the annual production, in pounds per acre, of air-dry weight for years when the site is in excellent condition.

The range site designation for each soil in the survey area is given at the end of each detailed map unit description.

Wet Land range site

Barney soils, 0 to 2 percent slopes, is the only map unit in this site. This map unit consists of nearly level, very poorly drained soils on bottom lands. These soils are shallow over sand that has a small amount of gravel. The surface layer ranges from silty clay to very fine sandy loam. The underlying material is loamy fine sand and sand. Permeability is very rapid in the underlying material, and the available water capacity is low. The kind of vegetation on this site is largely determined by the high water table that is at or near the surface during most of the growing season.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Prairie cordgrass and reedgrasses make up about 75 percent of the total plant production, and other perennial grasslike plants and forbs make up the rest. The main plants that increase under continuous overuse are sedges. If the site is in poor condition, the typical plant community consists of Kentucky bluegrass, foxtail barley, red clover, redtop, dandelion, asters, and sparse amounts of prairie cordgrass and sedges.

If the site is in excellent condition, the total annual production ranges from 3,500 pounds, air-dry weight, per acre in unfavorable years to 5,500 pounds in favorable years.

Subirrigated range site

Included in this site are nearly level soils on bottom lands. These soils are deep and somewhat poorly drained. The surface layer is dominantly silt loam and fine sandy loam. The underlying material is silty clay loam, very fine sandy loam, fine sandy loam, or loamy fine sand. Permeability is moderate or moderately rapid, and the available water capacity is high. The kind of vegetation on this site is largely determined by the high water table that is at a depth of 3 to 5 feet during most of the growing season.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Big bluestem, indiangrass, switchgrass, little bluestem, prairie cordgrass, slender wheatgrass, and Canada wildrye make up about 75 percent of the total plant production, and other perennial grasses, grasslike plants, and forbs make up the rest. The main plants that increase under continuous overuse are Kentucky bluegrass, green muhly, and sedges. If the site is in poor condition, the typical plant community consists of Kentucky bluegrass, redtop, dandelion, western ragweed, blue verbena, foxtail barley, and some western wheatgrass and sedges.

If the site is in excellent condition, the total annual production ranges from 4,500 pounds, air-dry weight per acre, in unfavorable years to 5,500 pounds in favorable years.

Saline Subirrigated range site

Gibbon silt loam, 0 to 2 percent slopes, is the only soil in this site. It is a nearly level, somewhat poorly drained, deep soil on bottom lands. The surface layer is silty. The underlying material is loamy and silty to a depth of about 44 inches. Below that, it is sandy to a depth of 60 inches. This soil is slightly or moderately affected by excess soluble salts and is moderately or strongly alkaline. The seasonal high water table ranges from a depth of 2 feet in wet years to 3 feet in dry years. The surface layer is calcareous. The kind of vegetation that grows on this site is mainly determined by the saline-alkali condition of the soil and the moderately deep water table.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Alkali sacaton, switchgrass, indiangrass, slender wheatgrass, plains bluegrass, and Canada wildrye make up about 80 percent of the total plant volume, and other perennial grasses and forbs make up the rest. The main plants that increase under continuous overuse are inland saltgrass and members of the sedge family. If the site is in poor condition, the typical plant community consists of inland saltgrass, blue grama, buffalograss, Kentucky bluegrass, dandelion, and various sedges.

If the site is in excellent condition, the total annual production ranges from a low of 4,000 pounds, air-dry weight, per acre in unfavorable years to 5,000 pounds in favorable years.

Silty Overflow range site

Included in this site are nearly level soils on bottom lands. These soils are deep and are well drained or moderately well drained. The surface layer is silt loam. The underlying material is silt loam, loam, or very fine sandy loam. Permeability is moderate, and the available water capacity is high. The kind of vegetation on this site is largely determined by the periodic overflow of water from soils in higher areas.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Big bluestem, little bluestem, switchgrass, slender wheatgrass, and Canada wildrye make up about 70 percent of the total plant production, and other grasses, grasslike plants, and forbs make up the rest. The main plants that increase under continuous overuse are western wheatgrass, green muhly, sideoats grama, Kentucky bluegrass, and sedges. If the site is in poor condition, the typical plant community consists of Kentucky bluegrass, western wheatgrass, and sedges.

If the site is in excellent condition, the total annual production ranges from 3,000 pounds, air-dry weight, per acre in unfavorable years to 4,500 pounds in favorable years.

Clayey Overflow range site

Fillmore silty clay loam, 0 to 1 percent slopes, is the only soil in this site. It is a deep, nearly level, poorly drained soil in shallow depressions. The surface layer is silty clay loam. The subsoil is silty clay and silty clay loam. Permeability is very slow, and the available water capacity is high. The kind of vegetation on this site is largely determined by the flooding caused by runoff from soils in higher areas.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Big bluestem, switchgrass, little bluestem, and Canada wildrye make up about 50 percent of the total plant production, and other grasses, grasslike plants, and forbs make up the rest. The main plants that increase under continuous overuse are western wheatgrass, Kentucky bluegrass, blue grama, buffalograss, and sedges. If the site is in poor condition, the typical plant community

consists of Kentucky bluegrass, blue grama, buffalograss, western ragweed, and sedges.

If the site is in excellent condition, the total annual production ranges from 2,000 pounds, air-dry weight, per acre in unfavorable years to 4,000 pounds in favorable years.

Silty Lowland range site

Included in this site are nearly level and very gently sloping soils on stream terraces and bottom lands. These soils are deep and are well drained and moderately well drained. The surface layer is silt loam and silty clay loam. The subsoil is silt loam, silty clay loam, or very fine sandy loam. Permeability is moderate or moderately slow, and the available water capacity is high. The kind of vegetation on this site is largely determined by the additional moisture that runs in from higher elevations.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Big bluestem, little bluestem, switchgrass, and Canada wildrye make up about 70 percent of the total plant production, and other grasses, grasslike plants, and forbs make up the rest. The main plants that increase under continuous overuse are western wheatgrass, sideoats grama, blue grama, and sedges. If the site is in poor condition, the typical plant community consists of Kentucky bluegrass, blue grama, sedges, and western ragweed.

If the site is in excellent condition, the total annual production ranges from 3,000 pounds, air-dry weight, per acre in unfavorable years to 4,500 pounds in favorable years.

Sandy Lowland range site

Included in this site are nearly level soils on bottom lands. These soils are deep and moderately well drained and somewhat excessively drained. The surface layer ranges from loam to fine sand. The underlying material ranges from loamy very fine sand to sand. Permeability is moderately rapid or rapid, and the available water capacity is low or moderate. The kind of vegetation on this site is largely determined by the water table that is at a depth of 5 to 8 feet during most of the growing season.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Sand bluestem, little bluestem, switchgrass, indiangrass, needleandthread, and Canada wildrye make up about 70 percent of the total plant production, and other grasses, grasslike plants, and forbs make up the rest. The main plants that increase under continuous overuse are prairie sandreed, blue grama, sand dropseed, Scribner panicum, western wheatgrass, and sedges. If the site is in poor condition, the typical plant community consists of sand dropseed, blue grama, Scribner panicum, western ragweed, and sedges.

If the site is in excellent condition, the total annual production ranges from 2,500 pounds, air-dry weight, per acre in unfavorable years to 4,000 pounds in favorable years.

Silty range site

Included in this site are deep, nearly level to steep, well drained soils on uplands and stream terraces. The surface layer is silt loam. The subsoil is silt loam or silty clay loam. The underlying material is silt loam. Permeability is moderate, and the available water capacity is high. The kind of vegetation on this site is largely determined by the silty, noncalcareous surface layer.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Big bluestem, little bluestem, sideoats grama, switchgrass, and indiangrass make up about 65 percent of the total plant production, and other perennial grasses, forbs, and shrubs make up the rest. The main plants that increase under continuous overuse are blue grama, buffalograss, western wheatgrass, sand dropseed, and sedges. If the site is in poor range condition, the typical plant community consists of blue grama, buffalograss, sand dropseed, and western ragweed.

If the site is in excellent condition, the total annual production ranges from 1,750 pounds, air-dry weight, per acre in unfavorable years to 3,500 pounds in favorable years.

Sandy range site

Anselmo fine sandy loam, 0 to 2 percent slopes, is the only soil in this site. This is a deep, nearly level, well drained soil mainly on stream terraces. The surface layer, subsoil, and underlying material are fine sandy loam. Permeability is moderately rapid, and the available water capacity is high. The kind of vegetation on this site is largely determined by the moderately rapid permeability.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Sand bluestem, little bluestem, switchgrass, sideoats grama, and prairie junegrass make up about 65 percent of the total plant production, and other perennial grasses, forbs, and shrubs make up the rest. The main plants that increase under continuous overuse are blue grama, needleandthread, prairie sandreed, sand dropseed, Scribner panicum, and sedges. If the site is in poor condition, the typical plant community consists of blue grama, Scribner panicum, sand dropseed, and western ragweed.

If the site is in excellent condition, the total annual production ranges from 1,500 pounds, air-dry weight, per acre in unfavorable years to 3,000 pounds in favorable years.

Limy Upland range site

Included in this site are very gently sloping to steep soils on uplands. These soils mainly are deep, but a few are moderately deep. They are well drained or somewhat excessively drained. Lime is at or near the surface. The

surface layer and subsoil are mainly silt loam. In a few areas, the surface layer is loam and clay loam, and the subsoil is clay loam. Permeability is moderate, and the available water capacity is low to high. The kind of vegetation on this site is largely determined by the limy condition of these silty and loamy soils.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Little bluestem, sideoats grama, big bluestem, switchgrass, plains muhly, and western wheatgrass make up about 80 percent of the total plant production, and other perennial grasses, forbs, and shrubs make up the rest. The main plants that increase under continuous overuse are blue grama, hairy grama, buffalograss, sand dropseed, and sedges. If the site is in poor condition, the typical plant community consists of blue grama, Kentucky bluegrass, Scribner panicum, sedges, sand dropseed, and western ragweed.

If the site is in excellent condition, the total annual production ranges from 1,500 pounds, air-dry weight, per acre in unfavorable years to 3,000 pounds in favorable years.

Shallow Limy range site

The Canyon part of Campus-Canyon loams, 9 to 30 percent slopes, is the only soil in this range site. This is a moderately steep and steep and somewhat excessively drained soil on uplands. This soil is shallow over fine-grained sandstone. The surface layer and underlying material are loam. Permeability is moderate, and the available water capacity is very low. The kind of vegetation on this site is largely determined by the shallow depth and limy surface layer of this soil.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Little bluestem, big bluestem, indiangrass, sideoats grama, prairie junegrass, plains muhly, and western wheatgrass make up about 70 percent of the total plant production, and other perennial grasses, forbs, and shrubs make up the rest. The main plants that increase under continuous overuse are blue grama, hairy grama, buffalograss, sand dropseed, and various sedges. This site is rarely in poor condition because the livestock prefer to graze in nearby areas that have smoother slopes.

If the site is in excellent condition, the total annual production ranges from 1,500 pounds, air-dry weight, per acre in unfavorable years to 2,500 pounds in favorable years.

Thin Loess range site

Coly silt loam, 30 to 60 percent slopes, is the only soil in this site. This is a deep, very steep, somewhat excessively drained soil on bluffs and in canyons of the loess uplands. The surface layer and underlying material are silt loam. Permeability is moderate, and the available water capacity is high. The kind of vegetation on this site is largely determined by the very steep slopes and the silty soil material.

The climax plant cover is a mixture of grasses that decrease if overgrazed by cattle throughout the season. Little bluestem, big bluestem, sideoats grama, plains muhly, switchgrass, and needleandthread make up about 70 percent of the total plant production, and other perennial grasses, forbs, and shrubs make up the rest. The main plants that increase under continuous overuse are blue grama, sand dropseed, western wheatgrass, and various sedges. If the site is in poor condition, the typical plant community consists of blue grama, sand dropseed, broom snakeweed, and various annuals.

If the site is in excellent condition, the total annual production ranges from 1,500 pounds, air-dry weight, per acre in unfavorable years to 2,500 pounds in favorable years.

Use of the soils for windbreaks

James W. Carr, Jr., forester, Soil Conservation Service, prepared this section.

Native woodland

Native woodland in Furnas County is limited to narrow strips on lowlands along the Republican River and its main tributaries and along Beaver and Sappa Creeks. Cottonwoods grow in the low, wet areas. American elm, green ash, hackberry, boxelder, and other wetland species are in the slightly drier and somewhat higher areas. A variety of willows are on sandbars and along streams. Native shrubs grow in widely scattered areas.

The natural stands have limited economic value. However, they do have esthetic value and are valuable as watershed and as wildlife habitat. Early settlers planted trees for shade, fenceposts, and to protect their houses. Throughout the years, landowners have continued to plant trees to protect buildings, livestock, and soil.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species

planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Trees in windbreaks grow at various rates, depending on the moisture conditions and fertility of the soil. The growth rate is also affected by the exposure and arrangement of the trees. Some species grow quickly when young but tend to die young. Eastern cottonwood occasionally is an example. Siberian elm and Russian-olive are vigorous when young, but they can be short lived. Also, they can spread into areas where they are not wanted. Boxelder and Russian mulberry commonly freeze back during severe winters, and green ash can be damaged by borers.

Table 4 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 4, based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from nurserymen.

The soils of Furnas County have been placed in windbreak suitability groups according to the characteristics that affect tree growth. The windbreak suitability designation for each soil is given at the end of each map unit description. The windbreak suitability groups in Furnas County are described in the following paragraphs.

Windbreak suitability group 1

This group consists of deep, nearly level and very gently sloping, well drained or moderately well drained soils on bottom lands and stream terraces. The surface layer and subsoil are silt loam or silty clay loam. Soils on the bottom lands are occasionally flooded, and in a few areas the soils on stream terraces are rarely flooded. The available water capacity is high.

The soils of this group generally provide good sites for planting trees; the survival and growth of adapted species is good. Competition for moisture from weeds and grasses is the main hazard. This can be eliminated by using conventional cultivation equipment between rows, by hand hoeing, or by using herbicides in the tree rows.

Windbreak suitability group 2

This group consists of deep, nearly level, somewhat poorly drained or poorly drained soils on bottom lands and in depressions. These soils have a seasonal high water table at a depth of 2 to 3 feet, or they receive additional water as runoff from higher lying soils. The surface layer is silty clay loam, silt loam, or fine sandy loam. The subsoil is silty clay and silty clay loam. The underlying material ranges from silty clay loam to loamy fine sand. The available water capacity is high.

The soils of this group provide good sites for planting trees; tree survival and growth are good. The high water table or occasional flooding is the main hazard. This hazard can be minimized by planting only those trees listed in table 4 as suitable for the soils in this group. Weeds, forbs, and grasses grow so abundantly and are so persistent that they are difficult to control.

Windbreak suitability group 3

This group consists of deep, nearly level, well drained, moderately well drained, or somewhat excessively drained soils on bottom lands and stream terraces. The surface layer is fine sandy loam in most areas but ranges from loam to fine sand. The underlying material ranges from very fine sandy loam to fine sand. The available water capacity ranges from low to high.

Soils of this group provide good sites for planting trees; the survival and growth of adapted species is fair. Soil blowing and insufficient moisture are the main hazards. Soil blowing can be prevented by maintaining strips of sod or other vegetation between the rows.

Windbreak suitability group 4

This group consists of deep, nearly level to moderately steep, well drained soils that are mainly on uplands. A few areas are on stream terraces. The surface layer is silt loam, and the subsoil is silt loam or silty clay loam. The available water capacity is high.

The soils of this group generally provide good sites for planting trees; the survival of adapted species is good, and their growth is fair. Drought and competition for moisture from weeds and grasses are the main hazards. These hazards can be minimized by planting only those species listed in table 4 as suitable for the soils in this group. Competition from weeds and grasses can be eliminated by using conventional cultivation equipment between rows, by hand hoeing, and by carefully using chemical herbicides in the tree rows. Trees should be planted on the contour if possible or in sloping areas. Tree growth may be somewhat slower on the steeper slopes because rapid runoff results in less moisture.

Windbreak suitability group 5

This group consists of deep, very gently sloping to moderately steep, well drained soils on uplands. The surface layer and underlying material are silt loam. These soils are calcareous at or near the surface and are weakly developed. The available water capacity is high.

The soils of this group provide fair sites for planting trees. The survival and growth of adapted species is fair to poor. Inadequate moisture and the calcareous condition of the soil are the main limitations. If trees are planted on the contour, moisture is stored between the rows and weeds can be controlled. The effect of the calcareous soil condition can be minimized by planting only those species listed in table 4 as suitable for the soils in this group.

Windbreak suitability group 8

The only soil in this group is Gibbon silt loam, saline, 0 to 2 percent slopes. This is a deep, nearly level soil on bottom lands. It is moderately and strongly affected by excess salts and alkalinity. The water table is at a depth of 2 to 3 feet in spring and at a depth of 3 to 6 feet in fall and in winter. The surface layer is silt loam and silty clay loam. The underlying material is very fine sandy loam, silty clay loam, and loamy fine sand. The saline-alkali salts are toxic to some tree species. The available water capacity is high.

This soil provides poor sites for planting trees. The survival and growth of adapted species is fair to poor. The saline-alkali condition is the main hazard. This hazard can be minimized by planting only those species listed in table 4 as suitable for the soil in this group.

Windbreak suitability group 10

This group consists of soils that have a wide range of characteristics. The soils are nearly level to very steep and are very poorly drained to somewhat excessively drained. They range from silty clay loam to coarse sand. Each soil in this group has at least one characteristic that makes it unsuitable for trees and shrubs. The soils are either too steep, are flooded too frequently, have a high water table, or have bedrock near the surface.

The soils generally are not suited to windbreak plantings because of their unfavorable characteristics. Suitable trees and shrubs for recreation and wildlife use can be planted in some areas if they are hand planted or if other approved planting methods are used.

Use of the soils for wildlife and recreation

Robert O. Koerner, biologist, Soil Conservation Service, prepared this section.

The wildlife population in Furnas County is determined largely by the quality and quantity of vegetation that is produced in an area. Wildlife inhabit an area if food, cover, and water are available in the proper combination.

Topography and soil characteristics such as fertility also determine wildlife numbers. In many areas soils that are well suited to use as wildlife habitat may not have a large wildlife population because of the present use of the soils. On such soils, the wildlife population can be increased with little cost and effort.

In other areas, soils that are not suited to livestock production or to crops because of steep slopes and rough, irregular topography are suited to wildlife habitat. In these areas, the natural undisturbed landscape can provide a source of food and cover for wildlife. Areas that have insufficient vegetation can be developed for use as wildlife habitat by planting flowering and fruiting trees and shrubs. The section on woodland and windbreaks gives the trees and shrubs that are suitable for planting on the soils of Furnas County.

Ponds can be developed for fish production. Wetness, permeability, and available water capacity are soil characteristics to consider in selecting pond sites. Fish ponds that are filled by runoff from fertile fields generally produce the most fish. The production of zooplankton (microscopic animals) and phytoplankton (microscopic plants), which provide food for the larger aquatic animals such as frogs, is increased in these ponds.

Kinds of wildlife by soil association

The *Holdrege-Uly* association includes tablelands that are used mainly as dryfarmed cropland. The most common cropping sequence is wheat-milo-fallow. This association provides food for wildlife species such as pheasant, bobwhite quail, white-tailed deer, and mule deer.

The *Coly-Uly-Holdrege* association provides escape cover as well as nesting areas for upland game birds. It also provides travel lanes to the areas of the Holdrege-Uly association. The canyons in the Coly-Uly-Holdrege association, many of which have flat bottoms, are cultivated or seeded to alfalfa. Tall, warm-season native grasses such as little bluestem and big bluestem grow on the side slopes of the canyons. Woody and herbaceous plants, such as coralberry, western snowberry, sumac, and native plum, grow together with native forbs and wildflowers, and they are ideal as food and cover for upland game birds such as pheasant and bobwhite quail. The canyons provide nesting and resting areas and escape cover. They are also used by deer and other wildlife as travel lanes between the streams and areas of cropland.

There are many farm ponds in the rangeland part of this association that provide water for wildlife and that are stocked with bass, bluegill, catfish, and bullhead for sport fishing.

Many thickets of plum and buckbrush are in areas of this association that are not cultivated. Woody thickets of smooth sumac, native plum, buckbrush, and western snowberry, along with native grasses such as big bluestem and little bluestem, switchgrass, and indiangrass, are along roadsides and provide excellent nesting habitat.

Many areas of "soil bank" land and fields in the "cropland adjustment" program are included in this association. These areas provide excellent habitat for upland game birds and for meadowlarks and mourning doves. Coyotes are prevalent and are the dominant predator species.

The *Gibbon-McCook-Inavale* association includes the Republican River and a small acreage at the confluence of the Beaver and Sappa Creeks. Cottonwood and willow trees are predominant, but some ash, boxelder, and elm (fig. 14) are also present. White-tailed deer and mule deer are common in this association (fig. 15).

Songbirds, hawks, owls, and eagles and racoons are numerous.

Corn and alfalfa are the main crops on flood plains above the river channel, and nearly all the acreage is irrigated. These areas provide food and cover for much of the river wildlife. Dense thickets of sumac, ash, and native plum that provide food and escape cover for wildlife are in many areas.

The *Hord-Cozad* association and the *Hord-Hobbs-Cozad* association provide food for many species of wildlife. The soils are nearly level to gently sloping, and most are in crops.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 5, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggar's ticks, wheatgrass, and grama.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas

are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, thrushes, woodpeckers, squirrels, fox, raccoon, and deer.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include antelope, white-tailed deer, desert mule deer, sage grouse, meadowlark, and lark bunting.

Recreation

Hunting deer, rabbits, and squirrels and upland game birds, such as pheasant and bobwhite quail, is an important form of recreation in Furnas County.

Fishing for largemouthed bass and bluegill is common in farm ponds throughout the county. The Republican River crosses the north part of the county and provides fishing for channel and flathead catfish and crappie.

Two areas in the county are maintained for recreation use by the Nebraska Game and Parks Commission. One area is at Oxford, and the other is at Cambridge. These areas provide picnic and camp sites and some fishing.

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 8, and interpretations for dwellings without basements and for local roads and streets, given in table 7.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They have moderate slopes and have few or no stones or boulders on the surface.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land de-

velopers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. If pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the large scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil are included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 7 shows, for each kind of soil, the degree and kind of limitations for building site development; table 8, for sanitary facilities. Table 10 shows the kind of limitations for water management. Table 9 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitation that affects shallow excavations, dwellings with and without a basement, small commercial buildings, and local roads and streets are indicated in table 7. A *slight* limitation indicates that soil properties generally are favorable for the specified use and that limitations are minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils that are rated severe, costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 7 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and with-

out basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 7 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 8 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, and *poor*, which mean about the same as *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard if the seasonal high water table is above the level of the lagoon floor. If the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils

generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 8 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

If it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the site should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 9 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 11 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low frost action potential, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 9 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given under the heading "Soil maps for detailed planning" and in table 11.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can restrict plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils or very firm clayey soils; soils that have suitable layers less than 8 inches thick; soils that have large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 10 the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of the soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features and engineering test data.

Engineering properties

Table 11 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 11 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil maps for detailed planning."

Texture is described in table 11 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 14. The estimated classification, without group index numbers, is given in table 11. Also in table 11 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and in plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 12 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems. In table 12 it is expressed as inches of water per inch of soil.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of

the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 13 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface,

and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 13 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are given in table 14.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil descriptions." The soil samples were analyzed by Nebraska Department of Roads.

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American Association of State Highway and Transportation Officials. The code for the Unified classification is assigned by the American Society for Testing and Materials.

The methods and codes are AASHTO classification (M-145-73); Unified classification (D-2487-69); mechanical analysis (T88-76I); liquid limit (T89-76I); plasticity index (T90-70); and specific gravity (T100-70).

The group index number that is a part of the AASHTO classification was computed using the Nebraska Modified System.

Physical and chemical analyses

Data on the physical and chemical properties of Hall, Holdrege, and Hord soils are published in Soil Survey Investigation Report No. 5 (*5*). Profiles from nearby counties were sampled, but the data are representative of these soils as they occur in Furnas County.

Much data on physical and chemical properties of soils can be obtained by analysis of the soils in a laboratory. The data are useful to soil scientists in classifying soils and in developing concepts of soil genesis, and they help in determining practical aspects of soil management such as tilth, fertility, soil blowing, and available water capacity. Data on reaction, electrical conductivity, and percent of exchangeable sodium help in evaluating

the possibility of reclaiming and managing saline-alkali areas.

Formation and classification of the soils

This section consists of two main parts. The first part describes how the factors of soil formation have affected soil formation in Furnas County, and the second part explains the system of soil classification currently used and places each soil series in the classes of that system.

Factors of soil formation

Soil is produced by soil-forming processes acting on material deposited or accumulated by geologic agents. The characteristics of the soil are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plants and animals are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plants and animals are conditioned by relief. The parent material also affects the kind of soil that is formed and, in extreme cases, determines the kind almost entirely. Finally, time is needed for changing the parent material into a soil and for the differentiation of soil horizons. In general, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

Parent material is the weathered or partly weathered rock in which a soil forms. It determines the chemical and mineralogical composition of the soil. The parent materials in which the soils in Furnas County formed are loess, colluvium, alluvium, and the more or less consolidated caliche of the Ogallala Formation.

Loess is wind-deposited, silty material. The soils on uplands formed in loess. The upper part of the loess mantle is of Peoria age; it is friable, massive, light gray or very pale brown silt loam. It is calcareous and has a few lime concretions. It ranges from a few feet to more than 100 feet in thickness.

The soils that formed in Peoria loess are in the Coly, Holdrege, Fillmore, and Uly series. Fillmore soils are in shallow depressions. Coly, Holdrege, and Uly soils are on divides, ridgetops, and side slopes. Soils that formed in Peoria loess make up about 76 percent of the acreage in Furnas County.

The Peoria loess is underlain by material of the Loveland Formation. Much of this material is assumed to be of loessial, or wind-deposited, origin. This material is brown or light yellowish brown silty clay loam and loam and has slightly more sand than Peoria loess. The Loveland material outcrops mainly on upland side slopes and on the lower part of valley sides, and, in places, on ridgetops where erosion is most severe. It is the parent material in which Nuckolls soils formed. Nuckolls soils make up 3.5 percent of the acreage in Furnas County.

Bedrock of the Ogallala Formation is beneath the Loveland loess. It is commonly called caliche and consists of calcareous ledges and bands of consolidated fine-grained sandstone or limestone that alternate with loosely consolidated sand, silt, gravel, and mortar-bed zones. The shallow Canyon soils and the moderately deep Campus soils formed in areas where this material is near the surface. These soils make up about 0.5 percent of the acreage in Furnas County.

Colluvium is the soil material that accumulates on foot slopes. It was transported only a short distance and was deposited by the combined action of gravity and water. In Furnas County, this material generally is dark colored silt loam. The gently sloping Hord and Cozad soils formed in colluvium. They make up 0.7 percent of the acreage in Furnas County.

Alluvium consists of material deposited by water on bottom lands and terraces of broad stream valleys or in narrow drainageways on uplands. Alluvium ranges widely in texture because of differences in the materials from which it originated and in the manner in which it was deposited. In Furnas County, the soils that formed in alluvium on stream terraces are in the Cozad, Hall, and Hord series. Anselmo soils are on stream terraces and formed in moderately coarse textured alluvium that has been reworked by wind. The soils that formed in more recent alluvium on bottom lands are in the Barney, Gibbon, Hobbs, Inavale, McCook, and Munjor series and in the Wann Variant. Soils that formed in alluvium make up 19.3 percent of the acreage in Furnas County.

Climate

Climate has been important in the formation of soils in Furnas County. It affects soils directly by its influence on parent material and indirectly by its influence on vegetation and micro-organisms.

The climatic factors that affect the weathering of parent material are rainfall, fluctuating temperature, and wind. In Furnas County, the average annual precipitation is about 23 inches. This amount of moisture is sufficient

to move carbonates from the surface layer to the subsoil and, in some soils, to the upper part of the underlying material. This downward movement of water can also account partly for the increase in clay content in the subsoil of some soils. An example is Fillmore soils that are in the depressions where the ponded water has accelerated the leaching process. Rainfall also affects soil formation through its influence on the kind and amount of vegetation that grows.

Alternate freezing and thawing hastens physical disintegration of the parent material. Summer heat and moisture speed chemical weathering. Wind transfers soil material from one place to another, thus slowing the process of formation. The extensive deposits of loess in this county are examples of the importance of wind as an agent of deposition of soil material. Drying aids in the development of granular structure in the surface layer. In winter, snow accumulates more on southeast-facing slopes and this results in additional moisture in these areas.

Micro-organisms in the soil have a temperature range in which they are most active; thus, the rate at which organic matter is decomposed to form humus varies. Changes in temperature and moisture activate the weathering of parent material, which results in chemical and physical changes in the soil.

Because the humidity in Furnas County generally is low, a fairly high loss of water occurs through evaporation and transpiration. This loss of water reduces the amount of water for leaching, vegetative growth, decomposition of organic matter, and chemical weathering.

Plant and animal life

Plants, animals, micro-organisms, earthworms, and other organisms are active in soil formation. Because trees, mainly hardwoods, were present in only a small part of Furnas County, mainly along stream channels, they have had only a slight influence on soil formation.

The soils of Furnas County formed mainly under a mixture of short, medium, and tall grasses. Each year the grasses formed new growth above ground and their fibrous roots penetrated the upper few feet of soil. In time, a darkened layer developed at the surface and gradually became thicker as more organic matter decayed to form humus. Because of the additional humus, these soils developed granular structure and good tilth.

Plant roots bring nutrients to the surface. Calcium in particular helps to keep the soils more porous. The decomposition of organic material forms organic acids that, in solution, hasten the leaching process and thus aid soil formation.

Living organisms are important in soil formation. The action of the micro-organisms helps to change undecomposed organic matter to humus. Some bacteria take in nitrogen from the air and when they die the nitrogen becomes available for plant growth. Other bacteria oxidize sulphur, which then also becomes available for plants. The plants, in turn, complete the cycle by producing more organic matter. Other living organisms such as algae, fungi, protozoa, and actinomycetes affect soil formation physically and chemically. Larger animals such as gophers, moles, earthworms, millipeds, spiders, and insects aid in mixing the soil and contribute to the organic matter content when they die.

Human activities also affect soil formation. Conservation tillage practices and terraces contribute to building and improving the soil. Additions of fertilizer and the use of irrigation water change the soil. Likewise, cultivation can contribute to soil loss unless care is taken to conserve the soils. The activities of man have an immediate effect on both the rate and direction of soil-forming processes.

Relief

Relief affects soil formation mainly through its influence on runoff, erosion, aeration, and drainage. Runoff is more rapid on steep and very steep slopes than on milder slopes. Consequently, plant growth generally is less vigorous, less water penetrates the soil, soil horizons are thinner and less distinct, and lime is not so deeply leached. Erosion is more severe on the steeper slopes if all other factors are equal.

Even in soils that have the same parent material, the influence of relief is evident in color, thickness, and horizonation of the soils. The gradient, shape, length, and direction of slope influence the amount of moisture in the soil. Steep and very steep soils, such as Coly soils, are weakly developed, have a thin surface layer, and have lime that is at or near the surface. In Uly soils, which are not quite so steep, the surface layer is thicker, lime is leached to a greater depth, and a thin subsoil has formed. In the nearly level to very gently sloping Holdrege soils, the surface layer is dark colored and thick, the subsoil is well developed, and lime is leached to a greater depth. Fillmore soils formed in shallow depressions and are more strongly developed than other soils in Furnas County. Coly, Uly, Holdrege, and Fillmore soils all formed in Peoria loess, and, consequently, their differences can largely be attributed to differences in relief.

Soils such as Barney, Gibbon, Inavale, Hobbs, McCook, Munjor, and Wann Variant are on bottom lands and have low relief. Soil formation is slow on bottom lands because the soils commonly receive sediment from flooding. Each period of flooding provides new parent material and starts a new cycle of soil formation. An example of a soil that formed on bottom lands and is frequently flooded is Hobbs silt loam, channeled.

Time

The soil-forming factors of relief, climate, and plant and animal life require time to change the parent material into soil. If the parent material has been in place for

only a short time, the factors of soil formation will have had little effect on it. The degree of profile development depends on the intensity of the soil-forming factors. Differences in the length of time that geological materials have been in place are commonly reflected in the distinctness of horizons in the soil profile.

The time required for a soil to form depends mainly on the kind of parent material and the climate. The finer the texture of the parent material, the longer the time needed for soil formation. The finer textures retard the downward movement of water, which is necessary for soil formation. Soils in warm, humid areas form faster than soils in cool, dry areas.

The concept of soil maturity has been explained in terms of time as it relates to the other four soil-forming factors. Soils that do not have a B horizon were commonly thought to be immature in their stage of formation, and soils that have a well developed B horizon were thought to be mature. However, the maturity of a soil depends on the interaction of all five factors. Thus, a very steep Coly soil that does not have a B horizon might actually have progressed to the limit of formation on its particular slope and in its particular climate. If expanding lattice clays are present, peds can form in very youthful material even if there is little organic matter present.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 15, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Fluv*, meaning river, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Ustifluvents (*Ust*, meaning burnt, plus *fluvent*, the suborder of Entisols that formed in stratified alluvium on flood plains).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Ustifluvents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is coarse-loamy, mixed (calcareous), mesic, Typic Ustifluvents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

General nature of the county

This section gives general information about Furnas County. Climate, physiography, relief, and drainage, water supply and natural resources, and trends in agriculture and soil use are discussed.

Climate

Prepared by Climatology Office, Conservation and Survey Division, University of Nebraska.

Furnas County has warm summers, cold winters, and rainfall that varies greatly in amount. It is close enough to the Rocky Mountains that the unbroken arrangement of the mountains to the west has a marked influence on

the climate. The climate is influenced also by the county's high elevation and its great distance from any large body of water.

Because there are no climatological barriers to the north and south, there are large temperature changes as the wind shifts from southerly to northerly, or vice versa. These changes are more pronounced in winter than in summer because in summer the large land mass to the north has warmed and is no longer a source of very cold air.

As the air masses that originated in the Pacific Ocean move over the Rocky Mountains, they change and arrive in the region comparatively dry. Nearly all the moisture in this area is carried in on warm, moist winds from the Gulf of Mexico or from the Caribbean Sea. The western edge of the moisture-laden southerly winds is often near the county. An eastward shift of this wind belt can result in a large decrease in rainfall, and a slight westward movement has the opposite effect. There is, therefore, a large variation in annual precipitation. Records at Beaver City for a 93-year period indicate that the driest year was 1910, when the precipitation was 11.3 inches, and the wettest year was 1883, when the precipitation amounted to 39.7 inches. Precipitation in winter is generally light; most of it is snow. Sometimes, the precipitation begins as rain and changes to snow. One or more periods of freezing rain occur nearly every winter. Slow, steady rains are characteristic early in spring. Nearly all the precipitation in summer is in the form of showers and thundershowers. In fall, thunderstorm activity usually decreases rapidly.

Sharp temperature changes are frequent and extreme in winter. Changes are less frequent in summer, but days with high temperatures are often interspersed with cooler days. In nearly every summer, temperatures reach 100 degrees or higher on one or more days.

Temperature records in Beaver City, which date back to 1893, show that the highest temperature, 116 degrees, occurred on July 13, 1934, on July 24, 1936, and on July 25, 1940. The lowest temperature, 35 degrees below zero, occurred on February 12, 1899. Table 16 gives temperature and precipitation data for Furnas County.

Probabilities of the last freezing temperatures in spring and the first in fall are listed in table 17. When freeze data are used, dates should be adjusted to fit the particular exposure. In less exposed areas the last freeze in spring will come at an earlier date and the first freeze in fall at a later date.

The topography in Furnas County has little effect on average temperatures over a long period of time. Records show, for example, that long-term average temperatures in flat land do not differ greatly from those on small rolling hills or in valleys in the immediate area. Records based on dates when specific temperatures are recorded may, however, differ markedly over short distances.

Annual evaporation of water in small lakes and farm ponds averages 54 inches, and about 74 percent of this occurs from May to October.

Physiography, relief, and drainage

Furnas County is in the Great Plains physiographic province. It is in an area that was once a smooth, gently sloping, loess-mantled plain. Geologic erosion and entrenchment by tributaries of the Republican River, Sappa Creek, Beaver Creek, and Medicine Creek have modified and dissected the plainlike surface. Between the major stream valleys is an upland landscape of long, narrow, nearly parallel divides and intermittent drainageways. These divides generally are in a north-south direction. Some are as wide as 1 mile, and side slopes are gently sloping to very steep. There are four distinct physiographic positions in Furnas County. These are the alluvial bottom lands, stream terraces, foot slopes, and loess-mantled uplands. Bedrock outcrops in a few areas, mainly on the south breaks to the valleys of Sappa Creek, Beaver Creek, and the Republican River.

The major streams and their principal tributaries are entrenched from 100 to 250 feet below the general elevation of the uplands. The valleys of the smaller tributaries are cut from 25 to 100 feet below the uplands. The drainageways are mainly V-shaped. They are narrow at their head and become deeper and wider downstream. Catsteps are common on the steep and very steep slopes. Stream terraces of the major valleys are about 15 to 30 feet above the bottom lands.

Almost all of the county is well drained, and runoff is mainly medium or rapid. Runoff is slow on the bottom lands, stream terraces, and the broad, nearly level divides. Nearly all of the county is drained by the Republican River. Beaver Creek, Sappa Creek, and Medicine Creek are the major tributaries of this river.

Water supply and natural resources

Ground water is available throughout Furnas County and is of suitable quality for livestock and domestic use. Wells range from 50 to 500 feet in depth. Sufficient ground water for irrigation is not available in all areas. Water is most readily available in the Republican River Valley and in the uplands north of the Republican River Valley. It is fairly available in Beaver Creek Valley and less available in Sappa Creek Valley. On the uplands, irrigation wells generally are 250 to 400 feet deep and yield as much as 2,000 gallons of water per minute. On the flood plains, wells are 50 to 125 feet deep and yield as much as 1,500 gallons per minute. On January 1, 1976, there were 412 irrigation wells registered with the Nebraska Department of Water Resources. Since 1974, about 46,000 acres have had available wells and could be irrigated if necessary.

About 17,000 acres on the north side of the Republican River are irrigated by ditchwater from the Frenchman-Cambridge Canal. About 3,500 acres on the south side of the Republican River are irrigated by ditchwater from the Bartley Canal. The Republican River is tapped near the western edge of the county and is the source of water for open-ditch irrigation.

The zone of saturation near the center of the Republican River Valley is 40 to 60 feet thick. Near the valley sides it is 1 to 20 feet thick. Ground water mainly enters the Republican River Valley through the fill of tributary valleys. In general, ground water moves in an eastward direction across the county.

Generally, the water table is at a depth of less than 10 feet on bottom lands; the depth increases on the stream terraces. Depth to the water table fluctuates seasonally. It is highest in spring and early in summer and lowest late in summer. The differences in depth are caused by variations in the amount and distribution of precipitation, pumping from wells, and changes in evapotranspiration caused by changes in temperature.

Soil and water are the most important natural resources in Furnas County. Sand and gravel are mined from several pits in the Republican River Valley. There is a small oil field in the extreme southwestern corner of the county.

Trends in agriculture and soil use

Farming has been the most important enterprise in Furnas County since the county was settled. In the early years, crops were produced only for local use. When railroads and grain elevators made markets available, crop and livestock production increased. Because of the rapid development of irrigation, crop production and farm income have increased significantly.

In Furnas County, agriculture consists mainly of crop production under dryland and irrigated management and a well balanced livestock program, mainly of beef cattle and hogs. The acreage of irrigated crops is increasing steadily. The greatest potential for the development of irrigated land is in the Republican River Valley and in the uplands north of the Republican River. In 1967, there were 33,609 acres of irrigated land; in 1970, this number had increased to 37,100 acres and in 1974, to 43,100 acres. The most common method of irrigation is the gravity system. In 1976, there were about 30 center-pivot sprinkler systems in operation, mainly on the upland divides. Their use is increasing. Irrigation wells are still being drilled.

According to Nebraska Agricultural Statistics, winter wheat is the most extensive crop in the county. In the past 10 years the acreage in winter wheat has increased from 47,910 acres in 1964 to 69,000 acres in 1974. Nearly all wheat is grown on dryfarmed land that has been summer fallowed the previous year. The acreage in corn increased from 30,340 acres in 1964 to 41,400 acres in 1974. About 77 percent of the acreage in corn is irrigated. The acreage in grain sorghum decreased from 55,750 in 1964 to 47,200 in 1974. About 95 percent of all sorghum is grown under dryland management and is used for grain. The acreage in alfalfa decreased from 14,210 acres in 1964 to 9,500 in 1974. About 71 percent of the acreage in alfalfa is irrigated. Minor crops grown and harvested in Furnas County are oats, barley, rye, soybeans, tame hay, and wild hay.

Livestock is important on most farms. The number of beef cows, 23,600 in 1974, has increased steadily since 1964. The number of dairy cattle, however, declined during this period from 2,170 to 1,100. Cattle being fattened in feedlots increased slightly from 19,000 to 22,500. Between 1964 and 1974, the number of cattle in the county increased 32 percent and the number of hogs increased 59 percent, from 11,950 to 19,000. Many farms fatten a few hogs for market, and there are a few farmers that fatten hogs in confined areas. There were about 2,400 sheep in the county in 1974. The number of chickens decreased from 38,300 in 1964 to 13,300 in 1974.

According to the U.S. Census of Agriculture, the total acres in cropland increased from 261,006 in 1964 to 269,050 in 1974. The number of farms decreased from 790 to 616, which reflects the trend to larger farms. In 1974, full owners operated about 38 percent of the farms; part owners 45 percent; and tenants 17 percent.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Buried soil. A developed soil, once exposed but now overlain by more recently formed soil.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Conservation tillage. A tillage system that creates the best environment possible for growing a crop with a limited amount of soil disturbance and maximum retention of crop residue on the soil surface.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Depth, soil. Total thickness of weathered soil material over mixed sand and gravel or bedrock. In Furnas County the following are the classes of soil depth:

Very shallow	0 to 10 inches
Shallow	10 to 20 inches
Moderately deep	20 to 40 inches
Deep	40 or more inches

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Immature soil. A soil lacking clearly defined horizons because the soil-forming forces have acted on the parent material for only a short time since it was deposited or exposed.

Intake rate. The average rate of water that enters the soil under irrigation. Intake rate for design purposes is not a constant but is a variable depending upon the net irrigation application. The rate of water intake, expressed in inches per hour, is as follows:

Very low	Less than 0.2
Low	0.2 to 0.4
Moderately low	0.4 to 0.75
Moderate	0.75 to 1.25
Moderately high	1.25 to 1.75
High	1.75 to 2.5
Very high	More than 2.5

Intermittent stream or drainageway. A flow of water that starts in direct response to precipitation. It receives little or no water from such sources as springs and melting snow.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse* more than 15 millimeters (about 0.6 inch).

Mulch. A natural or artificially applied layer of plant residue or other material on the surface of the soil.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Organic matter (soil). The part of the soil that includes plant and animal residues at various stages of decomposition. Commonly determined as those organic materials that accompany the soil when put through a 2 mm sieve. In this soil survey report, the content of organic matter is described as *very low* if it is less than 0.5 percent, *low* if 0.5 to 1.0 percent, *moderately low* if 1.0 to 2.0 percent, and *moderate* if 2.0 to 4.0 percent.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil

textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this soil survey report, the slope is described as *nearly level* if it is 0 to 2 percent, *very gently sloping* if 1 to 3 percent, *gently sloping* if 3 to 6 percent, *strongly sloping* if 6 to 9 percent, *moderately steep* if 9 to 15 percent, *steep* if 15 to 30 percent, and *very steep* if 30 to 60 percent.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Surface layer. In this soil survey report, the A horizon. See Horizon, soil.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Underlying material. Weathered soil material immediately beneath the solum. In Furnas County, it is the C horizon of the soil.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

ILLUSTRATIONS

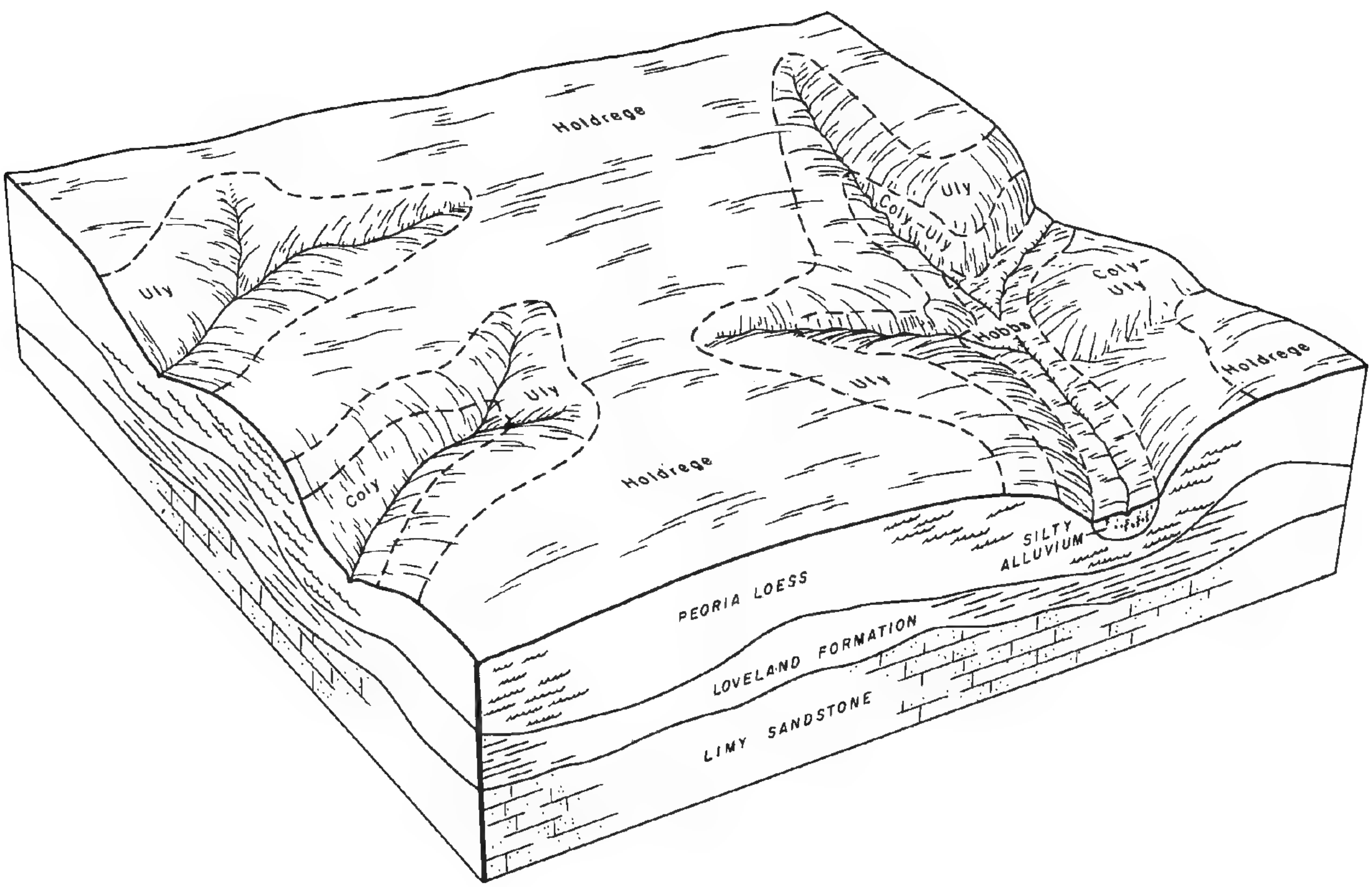

Figure 1.—Typical pattern of soils in the Holdrege-Uly association and the relationship of the soils to topography and parent material.

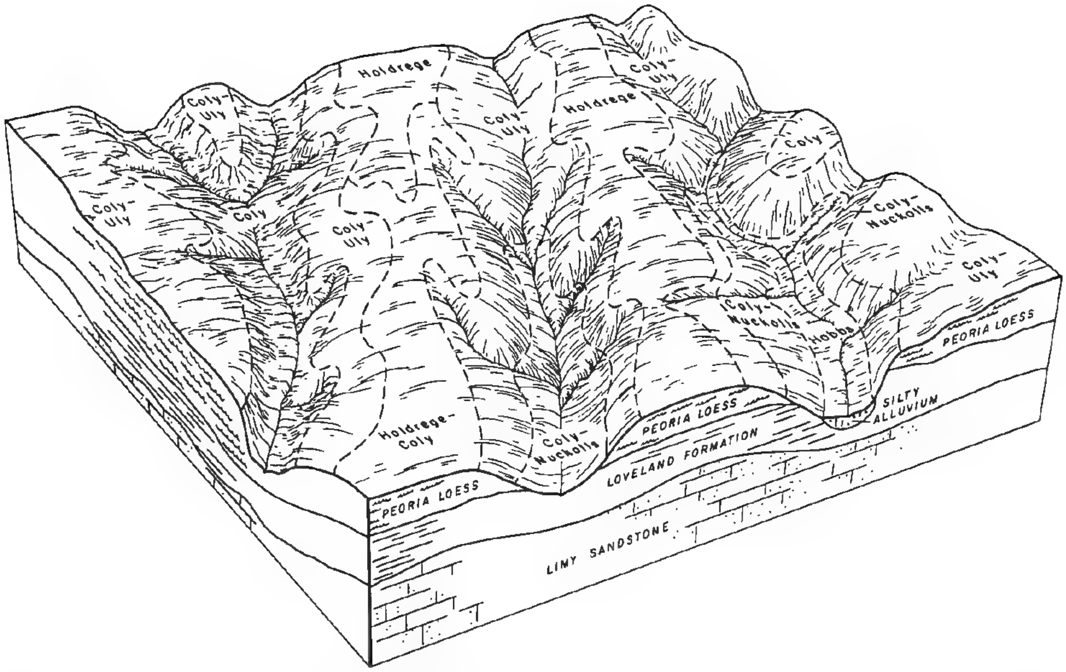

Figure 2.—Typical pattern of soils in the Coly-Uly-Holdrege association and the relationship of the soils to topography and parent material.

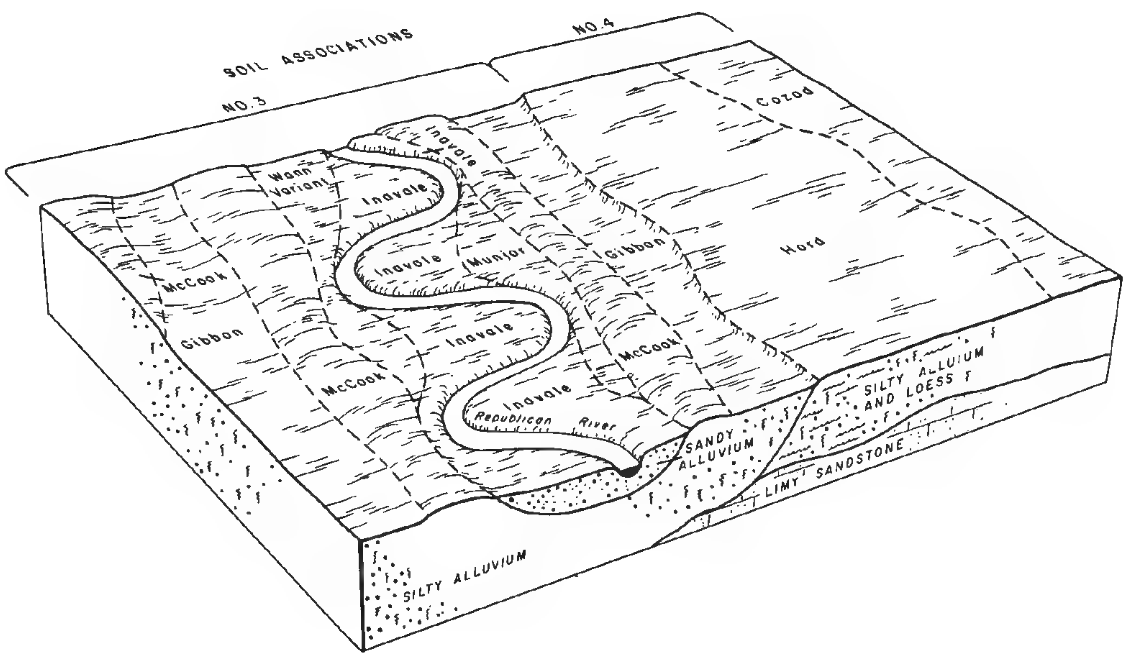

Figure 3.—Typical pattern of soils in the Gibbon-McCook-Inavale association and the Hord-Cozad association and the relationship of the soils to topography and parent material.

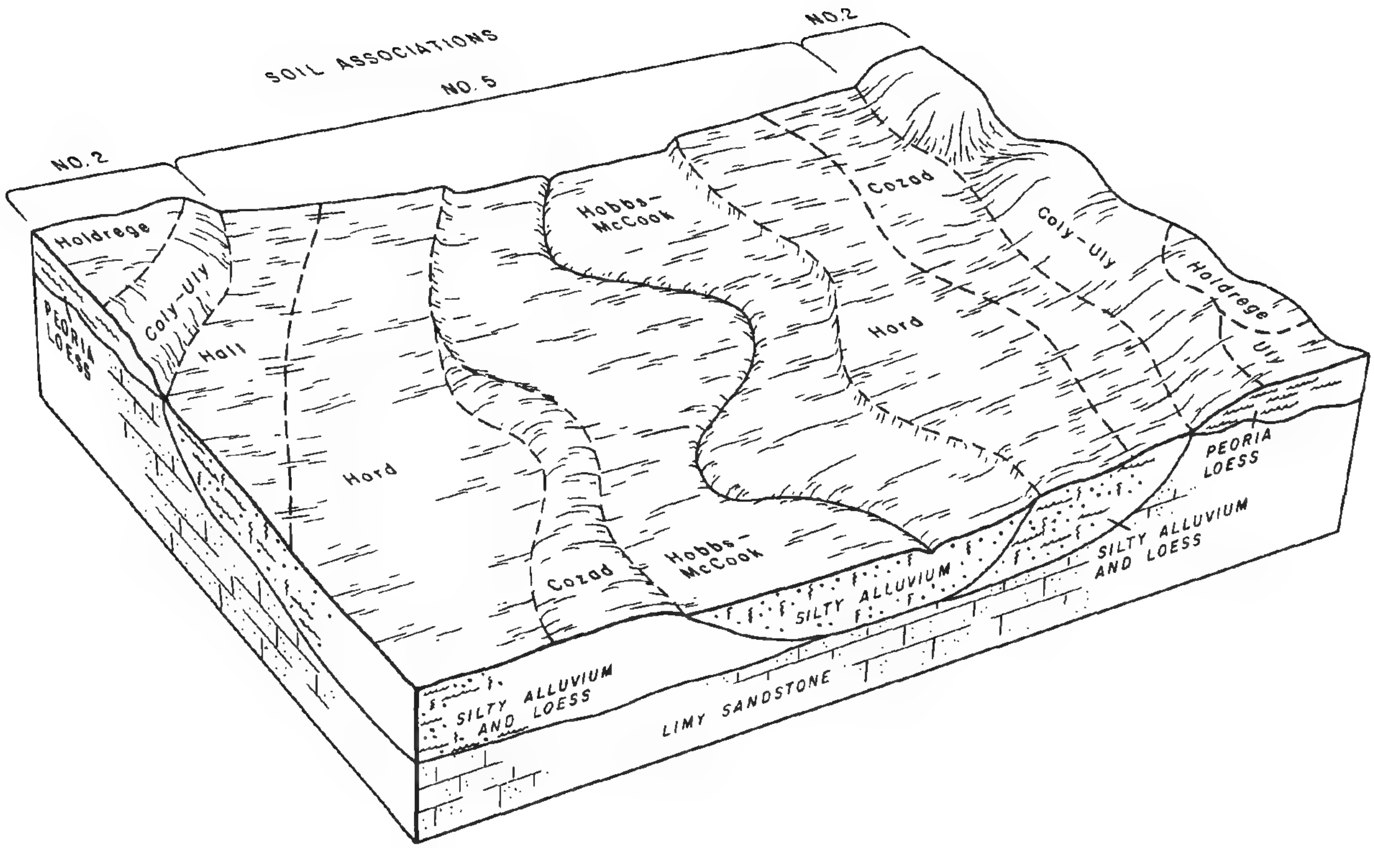

Figure 4.—Typical pattern of soils in the Hord-Hobbs-Cozad association and the Coly-Uly-Holdrege association and the relationship of the soils to topography and parent material.

Figure 5.—Profile of Canyon loam, a shallow soil that formed in weathered, fine-grained sandstone.

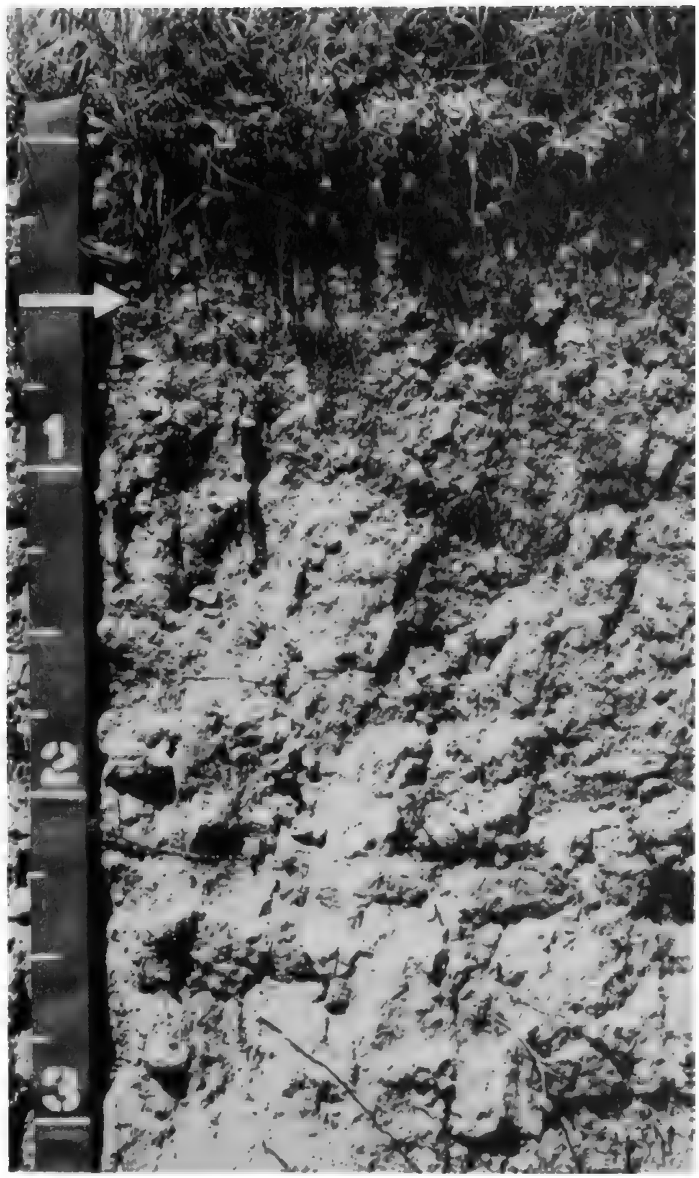

Figure 6.—Profile of Coly silt loam, a weakly developed soil that formed in loess.

Figure 7.—Typical landscape of Coly-Nuckolls silt loams, 9 to 30 percent slopes; farm pond is a part of an entrenched drainage system.

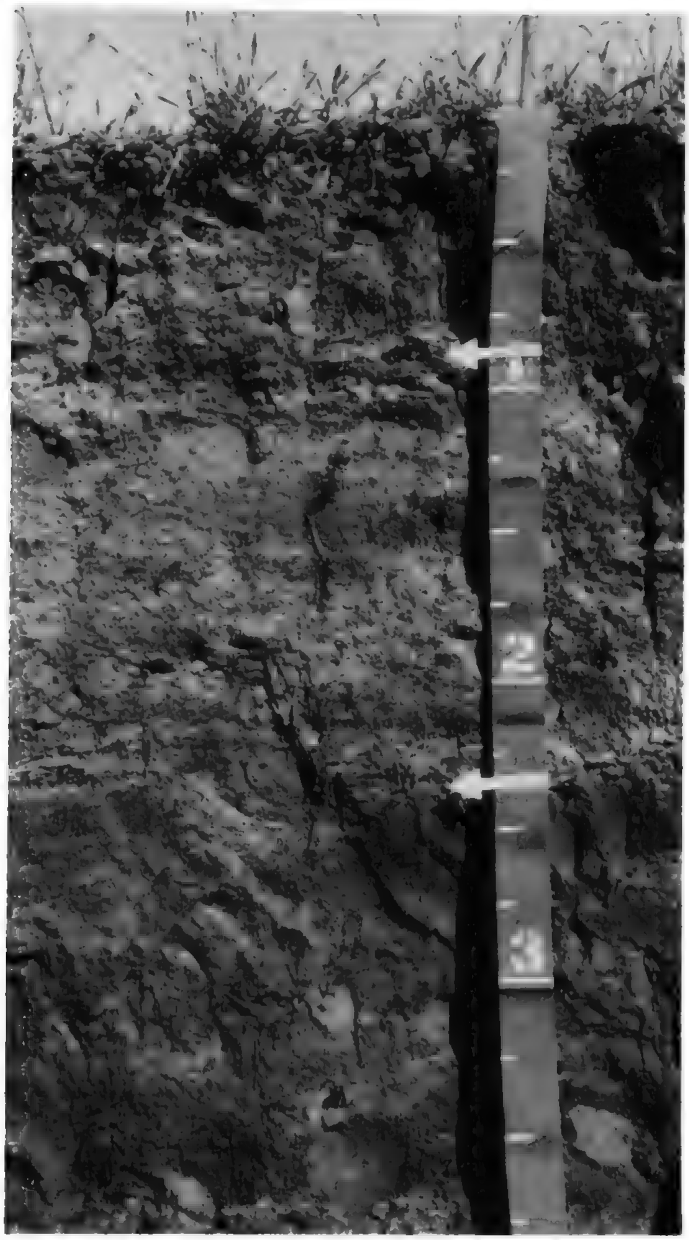

Figure 8.-Profile of Cozad silt loam, a deep, very friable soil on stream terraces and foot slopes.

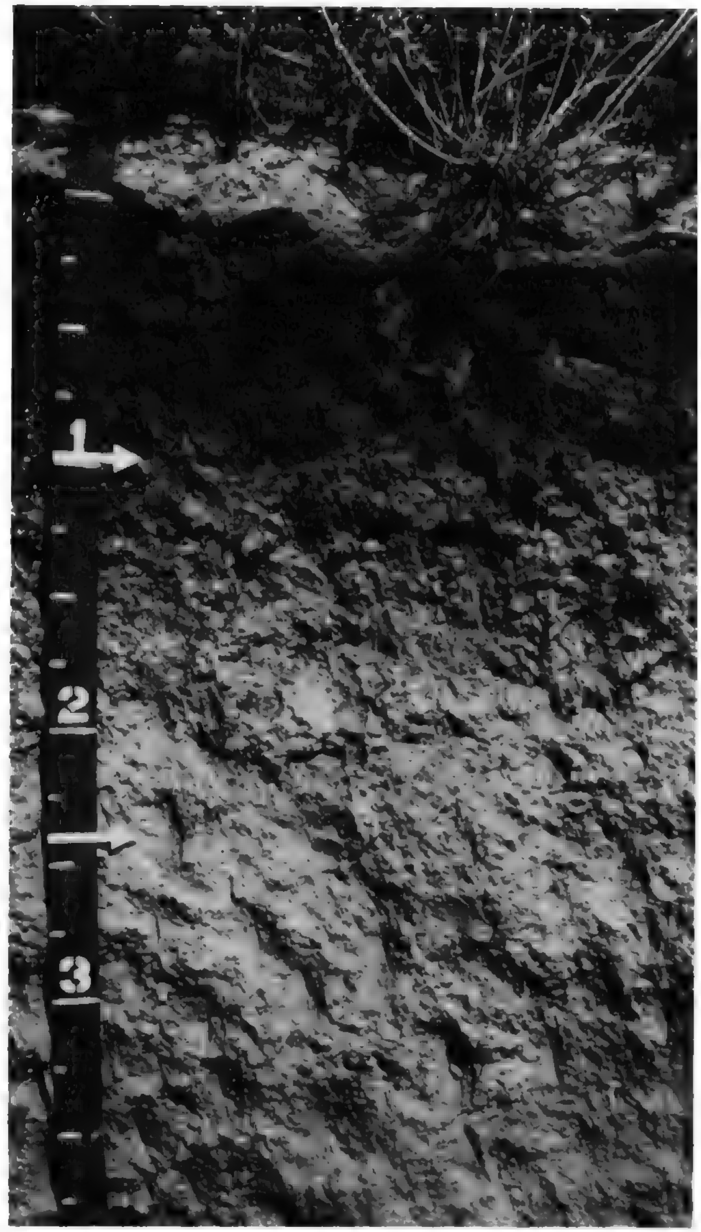

Figure 9.—Profile of Hobbs silt loam, a stratified soil that formed in silty alluvium on bottom lands.

Figure 10.—Profile of Holdrege silt loam, a well drained, silty soil that formed in loess on uplands.

Figure 11.—In the foreground, Coly-Uly silt loams, 3 to 9 percent slopes, eroded, need grassed waterways and crop residue left on the surface to control runoff and erosion; they are in capability unit IVe-9, dryland.

Figure 12.—The dam and reservoir provide water for livestock and wildlife and help prevent gully erosion on Coly-Nuckolls silt loams, 9 to 30 percent slopes, which are in capability unit VIe-9, dryland.

Figure 13.—Hord silt loam, 0 to 1 percent slopes, and other soils in capability unit 1-6, irrigated, are suited to all common irrigation systems.

Figure 14.—The woody vegetation and the adjacent cropland provide a diversity of food and cover for wildlife.

Figure 15.—White-tailed deer and mule deer are common along the Republican River.

TABLES

TABLE 1.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
An	Anselmo fine sandy loam, 0 to 2 percent slope	825	0.2
Bn	Barney soils, 0 to 2 percent slopes	715	0.2
CcF	Campus-Canyon loams, 9 to 30 percent slopes	2,000	0.4
CbE2	Coly silt loam, 9 to 15 percent slopes, eroded	12,740	2.8
CbG	Coly silt loam, 30 to 60 percent slopes	4,135	0.9
CkE2	Coly-Nuckolls silt loams, 9 to 15 percent slopes, eroded	4,455	1.0
CkF	Coly-Nuckolls silt loams, 9 to 30 percent slopes	44,559	9.6
CmC2	Coly-Uly silt loams, 3 to 9 percent slopes, eroded	43,240	9.4
CmF	Coly-Uly silt loams, 9 to 30 percent slopes	65,100	14.0
Co	Cozad silt loam, 0 to 1 percent slopes	9,690	2.1
CoB	Cozad silt loam, 1 to 3 percent slopes	2,955	0.6
CoC	Cozad silt loam, 3 to 6 percent slopes	1,285	0.3
Fm	Fillmore silty clay loam, 0 to 1 percent slopes	275	0.1
Gg	Gibbon silt loam, 0 to 2 percent slopes	6,860	1.5
Gs	Gibbon silt loam, saline, 0 to 2 percent slopes	660	0.1
Ha	Hall silt loam, 0 to 1 percent slopes	7,175	1.6
Hb	Hobbs silt loam, 0 to 2 percent slopes	1,750	0.4
Hc	Hobbs silt loam, channeled, 0 to 2 percent slopes	6,365	1.4
Hm	Hobbs-McCook silt loams, 0 to 2 percent slopes	12,455	2.7
Ho	Holdrege silt loam, 0 to 1 percent slopes	7,455	1.6
HoB	Holdrege silt loam, 1 to 3 percent slopes	128,800	27.8
HoC	Holdrege silt loam, 3 to 6 percent slopes	2,505	0.5
HoC2	Holdrege silt loam, 3 to 6 percent slopes, eroded	20,090	4.3
HpB2	Holdrege-Coly silt loams, 1 to 3 percent slopes, eroded	2,180	0.5
HpC2	Holdrege-Coly silt loams, 3 to 6 percent slopes, eroded	3,025	0.7
Hr	Hord silt loam, 0 to 1 percent slopes	16,910	3.7
HrB	Hord silt loam, 1 to 3 percent slopes	6,390	1.4
HrC	Hord silt loam, 3 to 6 percent slopes	1,740	0.4
In	Inavale soils, 0 to 2 percent slopes	4,595	1.0
Mc	McCook silt loam, 0 to 2 percent slopes	6,765	1.5
Mu	Munjor fine sandy loam, 0 to 2 percent slopes	1,065	0.2
UsB	Uly silt loam, 1 to 3 percent slopes	3,755	0.8
UsC	Uly silt loam, 3 to 9 percent slopes	24,250	5.2
Wb	Wann Variant fine sandy loam, 0 to 2 percent slopes	2,460	0.5
	Gravel pits	181	([1])
	Water	2,675	0.6
	Total	462,080	100.0

[1]Less than 0.1 percent.

TABLE 2.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only those potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Dashes indicate no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	6,765	---	---	---	---
(I)	47,995	---	---	---	---
II (N)	208,265	145,970	21,065	---	41,230
(I)	167,035	145,970	21,065	---	---
III (N)	31,380	28,645	2,735	---	---
(I)	36,635	33,240	2,735	660	---
IV (N)	72,745	72,085	---	660	---
(I)	67,490	67,490	---	---	---
V (N)	715	---	715	---	---
VI (N)	135,219	128,854	6,365	---	---
VII (N)	4,135	4,135	---	---	---
VIII(N)	---	---	---	---	---

TABLE 3.--YIELDS PER ACRE OF CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn		Grain sorghum		Alfalfa hay		Wheat, winter	
	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Ton	Ton	Bu	Bu
Anselmo:								
An	30	125	47	110	1.8	5.8	32	---
Barney:								
[1]Bn	---	---	---	---	---	---	---	---
Campus:								
[1]CcF	---	---	---	---	---	---	---	---
Coly:								
CbE2	---	---	---	---	---	---	---	---
CbG	---	---	---	---	---	---	---	---
[1]CkE2	---	---	---	---	---	---	---	---
[1]CkF	---	---	---	---	---	---	---	---
[1]CmC2	24	---	28	---	1.2	4.3	18	---
[1]CmF	---	---	---	---	---	---	---	---
Cozad:								
Co	38	140	53	120	2.9	6.5	38	---
CoB	33	135	49	115	2.5	6.0	36	---
CoC	28	120	38	100	2.6	5.4	32	---
Fillmore:								
Fm	20	80	35	85	1.5	3.0	20	---
Gibbon:								
Gg	55	130	60	115	3.0	6.5	32	---
Gs	---	---	35	90	2.0	4.0	20	---
Hall:								
Ha	40	145	55	120	2.8	6.5	38	---
Hobbs:								
Hb	40	130	55	115	3.0	5.8	35	---
Hc	---	---	---	---	---	---	---	---
[1]Hm	45	140	55	120	3.0	6.2	37	---
Holdrege:								
Ho	35	145	50	120	2.4	6.5	38	---
HoB	32	140	47	115	2.0	6.0	36	---
HoC	27	125	40	100	1.7	5.4	32	---
HoC2	22	100	30	95	1.4	5.2	27	---
[1]HpB2	27	125	40	110	1.7	5.4	32	---
[1]HpC2	19	95	25	85	1.2	4.8	23	---
Hord:								
Hr	40	145	55	120	3.0	6.5	38	---
HrB	35	140	52	115	2.6	6.0	36	---

See footnote at end of table.

TABLE 3.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn		Grain sorghum		Alfalfa hay		Wheat, winter	
	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Ton	Ton	Bu	Bu
Hord:								
HrC	30	125	45	100	2.7	5.4	32	---
Inavale:								
[1]In	25	90	35	95	1.0	4.0	18	---
McCook:								
Mc	42	145	55	120	3.0	6.5	38	---
Munjor:								
Mu	35	125	45	110	2.8	6.0	30	---
Uly:								
UsB	30	135	42	110	2.0	5.8	34	---
UsC	23	105	34	90	1.5	---	27	---
Wann Variant:								
Wb	40	100	50	95	2.5	6.0	27	---

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 4.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; the symbol > means more than. Absence of an entry indicates that trees do not grow to a given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Anselmo:					
An	Skunkbush sumac, Amur honeysuckle, common choke-cherry.	---	Eastern redcedar, green ash, hackberry, honeylocust, Rocky Mt. juniper.	Ponderosa pine, Austrian pine, Scotch pine.	Eastern cottonwood.
Barney:					
[1]Bn	Redosier dogwood	---	Golden willow	---	Eastern cottonwood.
Campus:					
[1]CcF:					
Campus part	Skunkbush sumac, Siberian peashrub.	Eastern redcedar, Rocky Mt. juniper, Russian-olive.	White mulberry, ponderosa pine, Austrian pine.	Siberian elm	---
Canyon part	---	---	---	---	---
Coly:					
CbE2	Skunkbush sumac, Siberian peashrub.	Eastern redcedar, Russian-olive.	Austrian pine, ponderosa pine, green ash, hackberry, honeylocust.	Siberian elm	---
CbG	---	---	---	---	---
[1]CkE2:					
Coly part	Skunkbush sumac, Siberian peashrub.	Eastern redcedar, Russian-olive.	Ponderosa pine	Siberian elm	---
Nuckolls part	Amur honeysuckle, skunkbush sumac.	Rocky Mt. juniper, Siberian peashrub, common chokecherry.	Eastern redcedar, ponderosa pine, green ash, Austrian pine, honeylocust, Russian-olive.	---	---
[1]CkF:					
Coly part	---	---	---	---	---
Nuckolls part	---	---	---	---	---
[1]CmC2:					
Coly part	Skunkbush sumac, Siberian peashrub.	Eastern redcedar, Russian-olive.	Ponderosa pine	Siberian elm	---
Uly part	Amur honeysuckle, skunkbush sumac.	Siberian peashrub, common choke-cherry.	Eastern redcedar, ponderosa pine, green ash, Austrian pine, honeylocust, Russian-olive, Rocky Mt. juniper.	---	---
[1]CmF:					
Coly part	---	---	---	---	---
Uly part	---	---	---	---	---

See footnote at end of table.

TABLE 4.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Cozad:					
Co, CoB	Amur honeysuckle	Autumn-olive, common chokecherry.	Eastern redcedar, Rocky Mt. juniper.	Ponderosa pine, Austrian pine, Scotch pine, green ash, hackberry, honeylocust.	Eastern cottonwood.
CoC	Amur honeysuckle	Russian-olive, common chokecherry, Siberian peashrub.	Eastern redcedar, green ash, hackberry, Rocky Mt. juniper.	Ponderosa pine, Austrian pine, Scotch pine, honeylocust.	---
Fillmore:					
Fm	Redosier dogwood	---	Golden willow	---	Eastern cottonwood.
Gibbon:					
Gg	Redosier dogwood	---	Eastern redcedar, green ash, boxelder.	Honeylocust	Eastern cottonwood.
Gs	Silver buffaloberry.	Eastern redcedar, green ash.	Golden willow	---	Eastern cottonwood.
Hall:					
Ha	Skunkbush sumac, common chokecherry, Siberian peashrub.	Autumn-olive	Eastern redcedar, green ash, hackberry, ponderosa pine, Austrian pine, Scotch pine.	Honeylocust	---
Hobbs:					
Hb	American plum, Peking cotoneaster, Amur honeysuckle.	Autumn-olive, common chokecherry.	Eastern redcedar, hackberry, boxelder.	Ponderosa pine, Austrian pine, honeylocust, green ash, silver maple.	Eastern cottonwood.
Hc	---	---	---	---	---
[1]Hm:					
Hobbs part	American plum, Peking cotoneaster, Amur honeysuckle.	Autumn-olive, common chokecherry.	Eastern redcedar, Russian mulberry.	Ponderosa pine, Austrian pine, honeylocust, green ash, silver maple.	Eastern cottonwood.
McCook part	Peking cotoneaster, Amur honeysuckle.	Autumn-olive, common chokecherry.	Eastern redcedar, hackberry.	Ponderosa pine, Austrian pine, green ash, honeylocust, silver maple.	---
Holdrege:					
Ho, HoB, HoC, HoC2	Amur honeysuckle, skunkbush sumac.	Common chokecherry, autumn-olive.	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, hackberry, green ash, Rocky Mt. juniper.	Honeylocust	---
[1]HpB2:					
Holdrege part	Amur honeysuckle, skunkbush sumac.	Common chokecherry, autumn-olive.	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, hackberry, green ash, Rocky Mt. juniper.	Honeylocust	---

See footnote at end of table.

TABLE 4.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
[1]HpB2:					
Coly part	Skunkbush sumac, Siberian peashrub.	Eastern redcedar, Russian-olive.	Ponderosa pine	Siberian elm	---
Holdrege:					
[1]HpC2:					
Holdrege part	Amur honeysuckle, skunkbush sumac.	Common choke-cherry, autumn-olive.	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, hackberry, green ash.	Honeylocust	---
Coly part	Skunkbush sumac, Siberian peashrub.	Eastern redcedar, Russian-olive.	Rocky Mt. juniper, ponderosa pine.	Siberian elm	---
Hord:					
Hr, HrB, HrC	Amur honeysuckle, skunkbush sumac.	Common choke-cherry, autumn-olive.	Eastern redcedar, ponderosa pine, Austrian pine, green ash, honeylocust, hackberry.	Honeylocust	---
Inavale:					
[1]In	Amur honeysuckle, American plum.	Autumn-olive, common choke-cherry.	Eastern redcedar, green ash.	Austrian pine, Scotch pine, ponderosa pine, honeylocust.	Eastern cottonwood.
McCook:					
Mc	Peking cotone-aster, Amur honeysuckle.	Autumn-olive, common choke-cherry.	Eastern redcedar hackberry.	Ponderosa pine, Austrian pine, green ash, honey-locust, silver maple.	Eastern cottonwood.
Munjor:					
Mu	Amur honeysuckle, American plum.	Autumn-olive, common choke-cherry.	Eastern redcedar, green ash.	Hackberry, Austrian pine, Scotch pine, ponderosa pine, honeylocust.	Eastern cottonwood.
Uly:					
UsB, UsC	Amur honeysuckle, skunkbush sumac.	Siberian peashrub, common choke-cherry.	Eastern redcedar, ponderosa pine, green ash, honey-locust, Russian-olive, Austrian pine, Rocky Mt. juniper.	---	---
Wann Variant:					
Wb	Redosier dogwood	---	Eastern redcedar, green ash, boxelder, Austrian pine, Scotch pine.	Honeylocust, golden willow.	Eastern cottonwood.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 5.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor"]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
An----------------- Anselmo	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
[1]Bn----------------- Barney	Very poor.	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair.
[1]CcF:											
Campus-------------	Poor	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Poor.
Canyon-------------	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
CbE2---------------- Coly	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
CbG----------------- Coly	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
[1]CkE2, CkF:											
Coly---------------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Nuckolls-----------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
[1]CmC2:											
Coly---------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Uly----------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
[1]CmF:											
Coly---------------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Uly----------------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Co, CoB------------- Cozad	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
CoC----------------- Cozad	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Fm------------------ Fillmore	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair	Good.
Gg------------------ Gibbon	Good	Good	Good	Fair	Good	Fair	Good	Good	Fair	Fair	Good.
Gs------------------ Gibbon	Fair	Good	Good	Fair	Good	Fair	Good	Fair	Fair	Fair	Fair.
Ha------------------ Hall	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Hb------------------ Hobbs	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Hc------------------ Hobbs	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.

See footnote at end of table.

TABLE 5.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
[1]Hm:											
Hobbs	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
McCook	Good	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Ho, HoB Holdrege	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
HoC, HoC2 Holdrege	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
[1]HpB2:											
Holdrege	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Coly	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
[1]HpC2:											
Holdrege	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Coly	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Hr, HrB Hord	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
HrC Hord	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
[1]In Inavale	Fair	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Mc McCook	Good	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Mu Munjor	Good	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
UsB Uly	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
UsC Uly	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Wb Wann Variant	Good	Good	Good	Fair	Good	Poor	Fair	Good	Fair	Fair	Good.

[1]See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 6.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Anselmo:				
An	Slight	Slight	Slight	Slight.
Barney:				
[1]Bn	Severe: floods, wetness.	Severe: floods.	Severe: wetness, floods.	Moderate: wetness, floods.
Campus:				
[1]CcF:				
Campus part	Severe: slope.	Severe: slope.	Severe: slope.	Slight.
Canyon part	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Moderate: slope.
Coly:				
CbE2	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
CbG	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]CkE2:				
Coly part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Nuckolls part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
[1]CkF:				
Coly part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Nuckolls part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
[1]CmC2:				
Coly part	Slight	Slight	Severe: slope.	Slight.
Uly part	Slight	Slight	Severe: slope.	Slight.
[1]CmF:				
Coly part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Uly part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Cozad:				
Co	Slight	Slight	Slight	Slight.
CoB, CoC	Slight	Slight	Moderate: slope.	Slight.
Fillmore:				
Fm	Severe: floods, wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness, floods, percs slowly.	Severe: wetness.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Gibbon:				
Gg, Gs	Severe: floods, wetness.	Moderate: floods, wetness, too clayey.	Moderate: floods, wetness, too clayey.	Moderate: too clayey, wetness.
Hall:				
Ha	Slight	Slight	Slight	Slight.
Hobbs:				
Hb, Hc	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
[1]Hm:				
Hobbs part	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
McCook part	Severe: floods.	Severe: floods.	Severe: floods.	Slight.
Holdrege:				
Ho	Slight	Slight	Slight	Slight.
HoB, HoC, HoC2	Slight	Slight	Moderate: slope.	Slight.
[1]HpB2:				
Holdrege part	Slight	Slight	Moderate: slope.	Slight.
Coly part	Slight	Slight	Moderate: slope.	Slight.
[1]HpC2:				
Holdrege part	Slight	Slight	Moderate: slope.	Slight.
Coly part	Slight	Slight	Moderate: slope.	Slight.
Hord:				
Hr	Slight	Slight	Slight	Slight.
HrB, HrC	Slight	Slight	Moderate: slope.	Slight.
Inavale:				
[1]In	Severe: floods.	Moderate: too sandy.	Moderate: floods, too sandy.	Moderate: too sandy.
McCook:				
Mc	Severe: floods.	Slight	Slight	Slight.
Munjor:				
Mu	Severe: floods.	Slight	Moderate: floods.	Slight.
Uly:				
UsB	Slight	Slight	Moderate: slope.	Slight.
UsC	Slight	Slight	Severe: slope.	Slight.
Wann Variant:				
Wb	Severe: floods.	Moderate: floods, wetness.	Moderate: floods, wetness.	Moderate: wetness.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Anselmo:					
An	Slight	Slight	Slight	Slight	Moderate: frost action.
Barney:					
[1]Bn	Severe: wetness, cutbanks cave.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
Campus:					
[1]CcF:					
Campus part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Canyon part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Coly:					
CbE2	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength, frost action.
CbG	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]CkE2:					
Coly part	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength, frost action.
Nuckolls part	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: shrink-swell, slope, frost action.
[1]CkF:					
Coly part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nuckolls part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]CmC2:					
Coly part	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, frost action.
Uly part	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, frost action.
[1]CmF:					
Coly part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Uly part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cozad:					
Co, CoB	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, frost action.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Cozad:					
CoC	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength, frost action.
Fillmore:					
Fm	Severe: floods, too clayey, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.
Gibbon:					
Gg, Gs	Severe: floods, wetness.	Severe: floods, frost action, wetness.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, frost action, wetness.
Hall:					
Ha	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Hobbs:					
Hb, Hc	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
[1]Hm:					
Hobbs part	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
McCook part	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Holdrege:					
Ho, HoB	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.
HoC, HoC2	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, frost action.
[1]HpB2:					
Holdrege part	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.
Coly part	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, frost action.
[1]HpC2:					
Holdrege part	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, frost action.
Coly part	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, frost action.
Hord:					
Hr, HrB	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.
HrC	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Inavale:					
[1]In	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
McCook:					
Mc	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, frost action.
Munjor:					
Mu	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Uly:					
UsB	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, frost action.
UsC	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, frost action.
Wann Variant:					
Wb	Severe: wetness, floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions "slight," "moderate," "good," and "fair"]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Anselmo:					
An	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Barney:					
[1]Bn	Severe: floods, wetness.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: thin layer, area reclaim, wetness.
Campus:					
[1]CcF:					
Campus part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Moderate: slope.	Poor: area reclaim, slope.
Canyon part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: thin layer, area reclaim, slope.
Coly:					
CbE2	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
CbG	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
[1]CkE2:					
Coly part	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
Nuckolls part	Moderate: percs slowly, slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
[1]CkF:					
Coly part	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Nuckolls part	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
[1]CmC2:					
Coly part	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Uly part	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
[1]CmF:					
Coly part	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Uly part	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Cozad:					
Co	Slight	Moderate: seepage.	Slight	Slight	Good.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Cozad:					
CoB, CoC	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Fillmore:					
Fm	Severe: percs slowly, floods, wetness.	Severe: floods, wetness.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: wetness, too clayey.
Gibbon:					
Gg, Gs	Severe: wetness, floods.	Severe: floods, wetness, seepage.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Hall:					
Ha	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Hobbs:					
Hb, Hc	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
[1]Hm:					
Hobbs part	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
McCook part	Severe: floods.	Severe: floods, seepage.	Severe: floods.	Severe: floods.	Good.
Holdrege:					
Ho	Slight	Moderate: seepage.	Slight	Slight	Good.
HoB, HoC, HoC2	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
[1]HpB2:					
Holdrege part	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Coly part	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
[1]HpC2:					
Holdrege part	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Coly part	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Hord:					
Hr	Slight	Moderate: seepage.	Slight	Slight	Good.
HrB, HrC	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Inavale:					
[1]In	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: too sandy.
McCook:					
Mc	Moderate: floods.	Severe: floods, seepage.	Moderate: floods.	Moderate: floods.	Good.
Munjor:					
Mu	Moderate: floods.	Severe: floods, seepage.	Severe: seepage.	Severe: seepage.	Good.
Uly:					
UsB, UsC	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Wann Variant:					
Wb	Severe: wetness.	Severe: seepage.	Severe: floods, wetness.	Severe: floods, wetness.	Good.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor"]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Anselmo:				
An	Fair: low strength.	Poor: excess fines.	Unsuited, excess fines.	Good.
Barney:				
[1]Bn	Poor: wetness.	Good	Good	Poor: area reclaim.
Campus:				
[1]CcF:				
Campus part	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim.
Canyon part	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim, slope.
Coly:				
CbE2	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim.
CbG	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]CkE2:				
Coly part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, area reclaim.
Nuckolls part	Fair: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
[1]CkF:				
Coly part	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Nuckolls part	Fair: shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]CmC2:				
Coly part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Uly part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
[1]CmF:				
Coly part	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Uly part	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cozad:				
Co, CoB, CoC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Fillmore:				
Fm	Poor: shrink-swell, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Gibbon:				
Gg, Gs	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Hall:				
Ha	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Hobbs:				
Hb, Hc	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
[1]Hm:				
Hobbs part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
McCook part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Holdrege:				
Ho, HoB, HoC, HoC2	Fair: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
[1]HpB2:				
Holdrege part	Fair: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Coly part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
[1]HpC2:				
Holdrege part	Fair: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Coly part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Hord:				
Hr, HrB, HrC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Inavale:				
[1]In	Good	Fair: excess fines.	Unsuited: excess fines.	Poor: thin layer.
McCook:				
Mc	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Munjor:				
Mu	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
Uly:				
UsB, UsC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
Wann Variant:				
Wb	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Anselmo:						
An	Seepage	Seepage, piping, erodes easily.	Not needed	Fast intake	Not needed	Erodes easily.
Barney:						
[1]Bn	Seepage	Seepage, erodes easily.	Wetness, floods, poor outlets.	Floods, wetness.	Not needed	Not needed.
Campus:						
[1]CcF:						
Campus part	Depth to rock	Thin layer, erodes easily.	Not needed	Erodes easily, droughty.	Depth to rock, erodes easily	Depth to rock, erodes easily
Canyon part	Depth to rock, slope.	Thin layer	Not needed	Rooting depth, slope.	Depth to rock, slope.	Droughty, slope.
Coly:						
CbE2, CbG	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
[1]CkE2:						
Coly part	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
Nuckolls part	Seepage	Piping, low strength.	Not needed	Erodes easily	Erodes easily	Erodes easily.
[1]CkF:						
Coly part	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
Nuckolls part	Seepage	Piping, low strength.	Not needed	Erodes easily	Erodes easily	Erodes easily.
[1]CmC2:						
Coly part	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
Uly part	Seepage	Piping, low strength.	Not needed	Erodes easily, slope.	Erodes easily, piping.	Erodes easily.
[1]CmF:						
Coly part	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
Uly part	Seepage	Piping, low strength.	Not needed	Erodes easily, slope.	Erodes easily, piping.	Erodes easily.
Cozad:						
Co	Seepage	Piping, low strength.	Not needed	Favorable	Favorable	Erodes easily.
CoB	Seepage	Piping, low strength.	Not needed	Erodes easily	Favorable	Erodes easily.
CoC	Seepage	Piping, low strength.	Not needed	Erodes easily	Erodes easily	Erodes easily.
Fillmore:						
Fm	Favorable	Shrink-swell, low strength, piping.	Poor outlets, percs slowly.	Wetness, slow intake, percs slowly.	Not needed	Not needed.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Gibbon:						
Gg, Gs	Seepage	Piping	Floods	Wetness, floods.	Not needed	Not needed.
Hall:						
Ha	Seepage	Piping, erodes easily.	Favorable	Favorable	Not needed	Favorable.
Hobbs:						
Hb, Hc	Seepage	Low strength, piping.	Floods	Floods	Not needed	Floods, erodes easily
[1]Hm:						
Hobbs part	Seepage	Low strength, piping.	Floods	Floods	Not needed	Not needed.
McCook part	Seepage	Piping, low strength.	Floods	Floods	Not needed	Not needed.
Holdrege:						
Ho	Seepage	Piping, low strength.	Not needed	Favorable	Favorable	Erodes easily.
HoB	Seepage	Piping, low strength.	Not needed	Erodes easily	Favorable	Erodes easily.
HoC, HoC2	Seepage	Piping, low strength.	Not needed	Erodes easily	Erodes easily	Erodes easily.
[1]HpB2:						
Holdrege part	Seepage	Piping, low strength.	Not needed	Erodes easily	Favorable	Erodes easily.
Coly part	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
[1]HpC2:						
Holdrege part	Seepage	Piping, low strength.	Not needed	Erodes easily	Erodes easily	Erodes easily.
Coly part	Seepage, slope.	Piping, low strength.	Not needed	Erodes easily, complex slope	Erodes easily, complex slope	Erodes easily, slope.
Hord:						
Hr	Seepage	Piping	Not needed	Favorable	Favorable	Favorable.
HrB, HrC	Seepage	Piping	Not needed	Erodes easily	Favorable	Favorable.
Inavale:						
[1]In	Seepage	Seepage, piping.	Not needed	Fast intake, seepage.	Not needed	Not needed.
McCook:						
Mc	Seepage	Piping, low strength.	Not needed	Not needed	Not needed	Not needed.
Munjor:						
Mu	Seepage	Low strength, piping.	Not needed	Fast intake, seepage.	Not needed	Not needed.
Uly:						
UsB, UsC	Seepage	Piping, low strength.	Not needed	Erodes easily, slope.	Erodes easily, piping.	Erodes easily.
Wann Variant:						
Wb	Seepage	Piping	Wetness, floods.	Seepage, floods.	Not needed	Not needed.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than]

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Anselmo:											
An	0-14	Fine sandy loam	SM	A-4, A-2	0	100	100	90-100	20-50	<20	NP
	14-33	Fine sandy loam	SM	A-4, A-2	0	100	100	90-100	20-50	<24	NP
	33-60	Fine sandy loam, loamy fine sand.	SM	A-4, A-2	0	100	100	90-100	15-50	<20	NP
Barney:											
[1]Bn	0-12	Silty clay loam, loam.	ML, CL	A-4, A-6	0	90-100	90-100	85-95	60-95	20-35	4-15
	12-18	Sandy loam, loamy fine sand.	SM, SM-SC	A-2, A-4	0	90-100	90-100	55-70	20-50	<25	NP-5
	18-60	Sand and gravel	SP, SW, GP, GW	A-1, A-2	0	45-100	35-60	5-20	0-5	---	NP
Campus:											
[1]CcF:											
Campus part	0-5	Loam	ML, CL	A-6, A-7, A-4	0	100	100	85-100	60-90	30-45	7-20
	5-39	Loam, clay loam	CL, ML	A-6, A-7,	0	100	100	75-95	50-80	33-45	8-20
	39-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Canyon part	0-9	Loam	ML, CL, SC, SM	A-4, A-6	0-5	95-100	75-100	45-95	35-75	15-30	2-15
	9-12	Very fine sandy loam, loam, silt loam.	ML, SM, SC, CL	A-4, A-6	0-5	60-100	50-100	45-95	35-90	15-25	NP-12
	12-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Coly:											
CbE2, CbG	0-60	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	22-40	2-20
[1]CkE2:											
Coly part	0-60	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	22-40	2-20
Nuckolls part	0-14	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	24-40	2-15
	14-28	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-98	28-48	10-25
	28-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	80-98	25-40	5-20
[1]CkF:											
Coly part	0-60	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	22-40	2-20
Nuckolls part	0-14	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	24-40	2-15
	14-28	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-98	28-48	10-25
	28-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	80-98	25-40	5-20
[1]CmC2:											
Coly part	0-60	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	22-40	2-20

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Coly:											
Uly part--------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	2-15
	10-20	Silt loam-------	ML, CL	A-4, A-6	0	100	100	100	90-100	25-40	3-18
	20-60	Silt loam-------	ML, CL	A-4, A-6	0	100	100	100	90-100	25-40	2-15
[1]CmF:											
Coly part-------	0-60	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	22-40	2-20
Uly part--------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	2-15
	10-20	Silt loam-------	ML, CL	A-4, A-6	0	100	100	100	90-100	25-40	3-18
	20-60	Silt loam-------	ML, CL	A-4, A-6	0	100	100	100	90-100	25-40	2-15
Cozad:											
Co, CoB, CoC------	0-14	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	80-100	20-40	2-20
	14-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	20-40	2-20
Fillmore:											
Fm----------------	0-15	Silty clay loam	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	15-37	Silty clay------	CH	A-7	0	100	100	100	95-100	50-75	30-45
	37-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
Gibbon:											
Gg, Gs------------	0-10	Silt loam-------	ML, CL	A-7, A-6, A-4	0	100	100	95-100	85-100	30-40	6-15
	10-20	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	25-45	15-25
	20-44	Stratified very fine sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	70-90	50-95	15-35	NP-15
	44-60	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-25
Hall:											
Ha----------------	0-8	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-20
	8-40	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-30
	40-60	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
Hobbs:											
Hb, Hc------------	0-9	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	9-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
[1]Hm:											
Hobbs part------	0-9	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	9-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
McCook part-----	0-20	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	60-98	20-35	2-15
	20-60	Very fine sandy loam, silt loam, loam.	ML, CL, CL-ML	A-4	0	100	100	95-100	55-98	15-30	NP-10
Holdrege:											
Ho, HoB, HoC, HoC2	0-11	Silt loam-------	ML, CL	A-4, A-6	0	100	100	95-100	90-100	24-40	2-18
	11-30	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	30-50	15-35
	30-60	Silt loam-------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Holdrege:											
[1]HpB2:											
Holdrege part---	0-11	Silt loam-------	ML, CL	A-4, A-6	0	100	100	95-100	90-100	24-40	2-18
	11-30	Silty clay loam	CL	A-7, A-6, A-4, A-7	0	100	100	98-100	95-100	30-50	15-35
	30-60	Silt loam-------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Coly part-------	0-60	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	22-40	2-20
[1]HpC2:											
Holdrege part---	0-11	Silt loam-------	ML, CL	A-4, A-6	0	100	100	95-100	90-100	24-40	2-18
	11-30	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	95-100	30-50	15-35
	30-60	Silt loam-------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Coly part-------	0-60	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	22-40	2-20
Hord:											
Hr, HrB, HrC------	0-17	Silt loam-------	CL, ML	A-4, A-6	0	100	100	100	90-100	20-35	5-18
	17-44	Silt loam, silty clay loam, loam.	CL, ML	A-6, A-4	0	100	100	98-100	90-100	25-40	5-23
	44-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-6, A-4, A-7	0	100	100	100	90-100	25-45	6-21
Inavale:											
[1]In---------------	0-5	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	5-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2	0	100	90-100	65-85	5-30	<25	NP-5
McCook:											
Mc----------------	0-20	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	60-98	20-35	2-15
	20-60	Very fine sandy loam, silt loam, loam.	ML, CL, CL-ML	A-4	0	100	100	95-100	55-98	15-30	NP-10
Munjor:											
Mu----------------	0-18	Fine sandy loam	SM, SC, ML, CL	A-2, A-4	0	100	95-100	65-100	30-75	<25	NP-10
	18-34	Stratified loamy very fine sand to silt loam.	SM, SC, ML, CL	A-2, A-4	0	100	95-100	65-100	30-65	<25	NP-10
	34-60	Loamy sand, sand, fine sand	SM, SP-SM	A-2, A-3	0	98-100	95-100	55-100	5-30	---	NP
Uly:											
UsB, UsC----------	0-10	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	2-15
	10-20	Silt loam-------	ML, CL	A-4, A-6	0	100	100	100	90-100	25-40	3-18
	20-60	Silt loam-------	ML, CL	A-4, A-6	0	100	100	100	90-100	25-40	2-15
Wann Variant:											
Wb----------------	0-5	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-85	30-45	<25	NP-5
	5-60	Fine sandy loam, very fine sandy loam, loamy very fine sand.	SM, ML, SM-SC, CL-ML	A-2, A-4	0	95-100	95-100	70-80	30-55	0-26	NP-5

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer]

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink- swell potential	Risk of corrosion		Erosion factors		Wind erodi- bility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
Anselmo:										
An	0-14	2.0-6.0	0.16-0.18	6.1-7.8	Low	Moderate	Low	0.20	5	3
	14-33	2.0-6.0	0.15-0.17	6.6-7.8	Low	Moderate	Low	0.20		
	33-60	2.0-6.0	0.14-0.16	7.4-8.4	Low	Moderate	Low	0.20		
Barney:										
[1]Bn	0-12	0.6-2.0	0.20-0.23	6.6-8.4	Low	High	Low	0.28	2	4L
	12-18	2.0-20	0.09-0.14	7.4-8.4	Low	High	Low	0.28		
	18-60	>20	0.02-0.04	6.6-7.8	Low	High	Low	0.10		
Campus:										
[1]CcF:										
Campus part	0-5	0.6-2.0	0.17-0.22	7.4-8.4	Low	Low	Low	0.28	4	4L
	5-39	0.6-2.0	0.17-0.19	7.4-8.4	Low	Low	Low	0.28		
	39-60	---	---	---	---	---	---	---		
Canyon part	0-9	0.6-6.0	0.20-0.22	7.4-8.4	Low	Low	Low	0.24	2	4L
	9-12	0.6-2.0	0.13-0.18	7.4-8.4	Low	Low	Low	0.32		
	12-60	---	---	---	---	---	---	---		
Coly:										
CbE2, CbG	0-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	5-4	4L
[1]CkE2:										
Coly part	0-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	4	4L
Nuckolls part	0-14	0.6-2.0	0.22-0.24	6.6-7.3	Moderate	High	Low	0.32	4	6
	14-28	0.6-2.0	0.18-0.20	6.6-7.8	Moderate	High	Low	0.43		
	28-60	0.6-2.0	0.18-0.20	7.4-7.8	Moderate	High	Low	0.43		
[1]CkF:										
Coly part	0-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	5	4L
Nuckolls part	0-14	0.6-2.0	0.22-0.24	6.6-7.3	Moderate	High	Low	0.32	5	6
	14-28	0.6-2.0	0.18-0.20	6.6-7.8	Moderate	High	Low	0.43		
	28-60	0.6-2.0	0.18-0.20	7.4-7.8	Moderate	High	Low	0.43		
[1]CmC2:										
Coly part	0-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	4	4L
Uly part	0-10	0.6-2.0	0.22-0.24	6.6-7.3	Moderate	Moderate	Low	0.32	4	6
	10-20	0.6-2.0	0.20-0.22	6.6-8.4	Moderate	High	Low	0.43		
	20-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43		
[1]CmF:										
Coly part	0-6	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	5	4L
Uly part	0-10	0.6-2.0	0.22-0.24	6.6-7.3	Moderate	Moderate	Low	0.32	5	6
	10-20	0.6-2.0	0.20-0.22	6.6-8.4	Moderate	High	Low	0.43		
	20-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43		
Cozad:										
Co, CoB, CoC	0-14	0.6-2.0	0.20-0.22	6.6-7.3	Low	Moderate	Low	0.32	5	6
	14-60	0.6-2.0	0.17-0.19	6.6-7.8	Low	High	Low	0.43		
Fillmore:										
Fm	0-15	0.6-2.0	0.22-0.24	5.6-6.5	Moderate	High	Low	0.37	4	7
	15-37	<0.06	0.11-0.13	6.6-7.8	High	High	Low	0.37		
	37-60	0.2-0.6	0.18-0.20	7.4-7.8	High	High	Low	0.37		
Gibbon:										
Gg, Gs	0-10	0.2-2.0	0.21-0.23	7.4-8.4	Moderate	High	Low	0.32	5	4L
	10-20	0.2-2.0	0.20-0.22	7.9-8.4	Moderate	High	Low	0.32		
	20-44	0.2-6.0	0.16-0.23	8.5-9.0	Low	High	Low	0.32		
	44-60	6.0-20	0.08-0.10	8.5-9.0	Low	High	Low	0.17		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodi-bility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
Hall:										
Ha	0-8	0.6-2.0	0.22-0.24	6.1-6.5	Moderate	Moderate	Low	0.32	5	6
	8-40	0.2-0.6	0.18-0.20	6.1-6.5	Moderate	Moderate	Low	0.32		
	40-60	0.6-2.0	0.20-0.22	6.6-7.8	Moderate	Moderate	Low	0.43		
Hobbs:										
Hb, Hc	0-9	0.6-2.0	0.21-0.24	6.1-7.8	Low	Low	Low	0.32	5	6
	9-60	0.6-2.0	0.18-0.22	6.1-8.4	Low	Low	Low	0.32		
[1]Hm:										
Hobbs part	0-9	0.6-2.0	0.21-0.24	6.1-7.8	Low	Low	Low	0.32	5	6
	9-60	0.6-2.0	0.18-0.22	6.1-8.4	Low	Low	Low	0.32		
McCook part	0-20	0.6-2.0	0.19-0.22	7.4-7.8	Low	High	Low	0.28	5	4L
	20-60	0.6-2.0	0.17-0.20	7.9-8.4	Low	High	Low	0.43		
Holdrege:										
Ho, HoB, HoC, HoC2	0-11	0.6-2.0	0.22-0.24	5.6-6.5	Moderate	Low	Low	0.32	5-4	6
	11-30	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	Low	Low	0.32		
	30-60	0.6-2.0	0.20-0.22	7.4-8.4	Moderate	Low	Low	0.43		
[1]HpB2:										
Holdrege part	0-11	0.6-2.0	0.22-0.24	5.6-6.5	Moderate	Low	Low	0.32	4	6
	11-30	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	Low	Low	0.32		
	30-60	0.6-2.0	0.20-0.22	7.4-8.4	Moderate	Low	Low	0.43		
Coly part	0-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	4	4L
[1]HpC2:										
Holdrege part	0-11	0.6-2.0	0.22-0.24	5.6-6.5	Moderate	Low	Low	0.32	4	6
	11-30	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	Low	Low	0.32		
	30-60	0.6-2.0	0.20-0.22	7.4-8.4	Moderate	Low	Low	0.43		
Coly part	0-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43	4	4L
Hord:										
Hr, HrB, HrC	0-17	0.6-2.0	0.22-0.24	6.1-7.3	Low	Moderate	Low	0.32	5	6
	17-44	0.6-2.0	0.20-0.22	6.1-7.3	Low	Moderate	Low	0.32		
	44-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43		
Inavale:										
[1]In	0-5	2.0-6.0	0.13-0.18	6.6-8.4	Low	High	Low	0.17	5	2
	5-60	6.0-20	0.09-0.11	6.6-8.4	Low	High	Low	0.17		
McCook:										
Mc	0-20	0.6-2.0	0.19-0.22	7.4-7.8	Low	High	Low	0.28	5	4L
	20-60	0.6-2.0	0.17-0.20	7.9-8.4	Low	High	Low	0.43		
Munjor:										
Mu	0-18	2.0-6.0	0.14-0.20	7.4-8.4	Low	Low	Low	0.28	5	3
	18-34	2.0-6.0	0.13-0.18	7.4-8.4	Low	Low	Low	0.28		
	34-60	6.0-20	0.06-0.09	7.4-8.4	Low	Low	Low	0.28		
Uly:										
UsB, UsC	0-10	0.6-2.0	0.22-0.24	6.1-7.3	Moderate	Moderate	Low	0.32	5	6
	10-20	0.6-2.0	0.20-0.22	6.1-7.8	Moderate	High	Low	0.43		
	20-60	0.6-2.0	0.20-0.22	7.4-8.4	Low	High	Low	0.43		
Wann Variant:										
Wb	0-5	2.0-6.0	0.16-0.18	6.6-7.8	Low	Moderate	Low	0.20	5	3
	5-60	2.0-6.0	0.15-0.17	7.9-8.4	Low	High	Low	0.20		

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	
					Ft			In		
Anselmo:										
An	A	None	---	---	>6.0	---	---	>60	---	Moderate.
Barney:										
[1]Bn	D	Frequent	Long	Mar-Jun	0-3.0	Apparent	Nov-Jun	>60	---	Moderate.
Campus:										
[1]CcF:										
Campus part	B	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Canyon part	D	None	---	---	>6.0	---	---	6-20	Rippable	Low.
Coly:										
CbE2, CbG	B	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]CkE2:										
Coly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Nuckolls part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]CkF:										
Coly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Nuckolls part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]CmC2:										
Coly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Uly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]CmF:										
Coly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Uly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Cozad:										
Co, CoB, CoC	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Fillmore:										
Fm	D	Occasional	Long	Apr-Jul	1.0-3.0	Perched	Mar-Jul	>60	---	High.
Gibbon:										
Gg	B	Occasional	Very brief	Mar-Jul	3.0-4.0	Apparent	Nov-Jun	>60	---	High.
Gs	B	Occasional	Brief	Mar-Jul	2.0-3.0	Apparent	Nov-Jun	>60	---	High.
Hall:										
Ha	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Hobbs:										
Hb, Hc	B	Common	Brief	Apr-Sep	>6.0	---	---	>60	---	Moderate.
[1]Hm:										
Hobbs part	B	Occasional	Brief	Apr-Sep	>6.0	---	---	>60	---	Moderate.
McCook part	B	Occasional	Brief	Apr-Jul	>6.0	---	---	>60	---	Moderate.
Holdrege:										
Ho, HoB, HoC, HoC2	B	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]HpB2:										
Holdrege part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Coly part	B	None	---	---	>6.0	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	
					Ft			In		
Holdrege:										
[1]HpC2:										
Holdrege part--	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Coly part------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Hord:										
Hr, HrB, HrC-----	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Inavale:										
[1]In--------------	A	Occasional--	Very brief	Jan-Jul	>6.0	---	---	>60	---	Low.
McCook:										
Mc---------------	B	Rare to occasional.	Very brief	Apr-Jul	>5.0	---	---	>60	---	Moderate.
Munjor:										
Mu---------------	B	Rare--------	---	---	>5.0	---	---	>60	---	Low.
Uly:										
UsB, UsC---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Wann Variant:										
Wb---------------	B	Occasional	Brief-----	Mar-Jul	3.0-4.0	Apparent	Apr-Jun	>60	---	High.

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for the composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING TEST DATA[1]

Soil name and location	Parent material	Report number S73	Depth	Horizon	Specific gravity	Percentage passing sieve[2] No. 10	No. 40	No. 60	No. 200	Percentage smaller than[2] 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification AASHTO[3]	Unified[4]
			In												Pct		
Coly silt loam: 25 feet north and 175 feet east of the southwest corner of sec. 17, T. 2 N., R. 25 W. (Modal)	Loess	1428	0-5	A	2.60			100	94	84	40	25	20	39	13	A-6(9)	ML
		1429	29-60	C2	2.67			100	97	88	43	22	17	34	10	A-4(8)	ML
Cozad silt loam: 190 feet west and 2,535 feet north of the center of sec. 29, T. 4. N., R. 22 W. (Modal)	Alluvium	1433	0-9	Ap	2.63			100	98	91	47	27	23	34	9	A-4(8)	ML
		1434	14-23	B22	2.66			100	99	92	43	25	22	35	11	A-6(8)	ML
		1435	29-40	C1	2.68			100	99	92	41	21	19	33	7	A-4(8)	ML
Holdrege silt loam: 1,320 feet west and 580 feet south of the northeast corner of sec. 28, T. 3 N., R. 22 W. (Modal)	Loess	1430	0-8	Ap	2.64			100	98	89	41	25	22	33	10	A-4(8)	CL
		1431	11-14	B21t	2.68			100	98	92	53	35	31	46	25	A-7-6 (15)	CL
		1432	30-60	C	2.70			100	99	91	45	24	18	33	9	A-4(8)	ML
Hord silt loam: 450 feet south and 100 feet west of the northeast corner of sec. 32, T. 4 N., R. 24 W. (Modal)	Alluvium	1436	0-8	Ap	2.63		100	99	95	87	31	21	17	30	6	A-4(8)	ML
		1437	17-29	B2	2.66	100	99	97	90	79	30	21	17	29	6	A-4(8)	ML
		1438	48-60	Cb	2.69		100	99	97	91	61	38	31	42	20	A-7-6 (12)	CL
McCook loam: 2,345 feet east and 1,010 feet south of the northwest corner of sec. 31, T. 4 N., R. 22 W. (Modal)	Alluvium	1580	0-7	Ap	2.61		100	99	92	85	43	28	20	35	12	A-6(9)	CL
		1581	13-20	AC	2.66			100	96	87	35	19	15	32	8	A-4(8)	ML
		1582	20-40	C1	2.67		100	99	78	63	17	11	9	24	2	A-4(8)	ML
Munjor fine sandy loam: 1,200 feet east and 100 feet south of the center of sec. 33, T. 4 N., R. 25 W. (Modal)	Alluvium	1422	0-7	Ap	2.63	100	96	86	43	26	8	6	5	---	[5]NP	A-4(2)	SM
		1443	7-18	AC	2.66	100	98	90	53	34	8	6	5	---	NP	A-4(4)	ML

TABLE 14.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report number S73	Depth	Horizon	Specific gravity	Percentage passing sieve[2] No. 10	No. 40	No. 60	No. 200	Percentage smaller than[2] 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification AASHTO[3]	Unified[4]
			In												Pct		
Nuckolls silt loam: 100 feet east and 750 feet north of the southwest corner of sec. 18, T. 1 N., R. 23 W. (Modal)	Loess (Loveland Formation)	1439	0-15	A	2.65			100	97	89	40	26	22	36	13	A-6(9)	CL
		1440	18-28	B2	2.69			100	97	91	52	34	32	41	20	A-7-6 (12)	CL
		1441	37-60	C	2.69			100	96	89	43	32	29	36	17	A-6(11)	CL

[1]Tests performed by the Nebraska Department of Roads according to standard procedures of the American Association of State Highway and Transportation Officials (AASHTO).

[2]Mechanical analysis according to the American Association of State Highway and Transportation Officials Designation T88-76I. Results by this procedure frequently differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analysed by thé hydrometer method, and the various grain-size fractions are calculated on the basis of all the material including that coarser than 2 mm in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 mm in diameter is excluded from calculations of grain-size fractions. The mechanical analyses in this table are not suitasble for use in naming textural classes for soil.

[3]Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing Pt. 1, Ed. 8): The Classificatior of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHTO Designation M 145-73.

[4]Based on the Unified Soil Classification System ASTM Designation D-2487-69.

[5]NP means nonplastic.

TABLE 15.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Anselmo	Coarse-loamy, mixed, mesic Typic Haplustolls
Barney	Sandy, mixed, mesic Mollic Fluvaquents
Campus	Fine-loamy, mixed, mesic Typic Calciustolls
Canyon	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Cozad	Fine-silty, mixed, mesic Typic Haplustolls
Fillmore	Fine, montmorillonitic, mesic Typic Argialbolls
Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Holdrege	Fine-silty, mixed, mesic Typic Argiustolls
Hord	Fine-silty, mixed, mesic Cumulic Haplustolls
Inavale	Sandy, mixed, mesic Typic Ustifluvents
McCook	Coarse-silty, mixed, mesic Fluventic Haplustolls
Munjor	Coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents
Nuckolls	Fine-silty, mixed, mesic Typic Haplustolls
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Wann Variant	Coarse-loamy, mixed, mesic Aquic Ustifluvents

TABLE 16.--TEMPERATURE AND PRECIPITATION

[Data from records at Beaver City, Nebraska]

Month	Temperature				Precipitation				
	Average daily maximum[1]	Average daily minimum[1]	Two years in 10 will have at least 4 days with-- Maximum temperature equal to or higher than[2]	Two years in 10 will have at least 4 days with-- Minimum temperature equal to or lower than[2]	Average monthly total[1]	One year in 10 will have-- Equal to or less than[3]	One year in 10 will have-- Equal to or more than[3]	Days with 1 inch or more snow cover[4]	Average depth of snow on days with snow cover[4]
	°F	°F	°F	°F	In	In	In	Number	In
January---	40	12	61	-8	0.6	5/	1.0	12	4
February--	47	18	68	0	0.7	0.1	1.4	8	3
March-----	55	25	75	9	1.3	0.1	2.4	6	6
April-----	68	37	87	24	1.7	0.5	4.8	1	3
May-------	77	48	92	35	3.7	0.9	6.5	--	--
June------	87	58	103	49	4.2	1.0	6.8	--	--
July------	93	63	104	55	3.3	1.2	6.4	--	--
August----	92	62	103	53	2.4	0.8	4.6	--	--
September-	83	51	100	37	2.1	0.2	3.9	--	--
October---	72	39	90	25	1.6	0.1	3.5	6/	1
November--	54	25	73	6	0.7	5/	2.1	3	3
December--	43	16	64	-4	0.6	5/	1.3	9	3
Year---	66	38	7/106	8/-15	22.9	14.6	29.6	39	3

1Data based on period 1945-74.
2Data based on computer study for period 1948-63.
3Data based on period 1882-1974.
4Data based on estimate from nearby stations.
5Trace.
6Less than half a day.
7Average annual highest maximum.
8Average annual lowest minimum.

TABLE 17.--FREEZE DATES IN SPRING AND FALL[1]
[Data from Beaver City, Nebraska]

Probability	Temperature and dates for given probability				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than--	Apr. 8	Apr. 16	Apr. 26	May 10	May 21
2 years in 10 later than--	Apr. 3	Apr. 11	Apr. 20	May 4	May 15
5 years in 10 later than--	Mar. 23	Mar. 31	Apr. 10	Apr. 24	May 5
Fall:					
1 year in 10 earlier than-	Oct. 27	Oct. 21	Oct. 13	Oct. 2	Sept. 21
2 years in 10 earlier than-	Nov. 1	Oct. 26	Oct. 18	Oct. 7	Sept. 26
5 years in 10 earlier than-	Nov. 12	Nov. 5	Oct. 29	Oct. 17	Oct. 5

[1]Freeze data are based on temperatures at a standard thermometer shelter of the National Weather Service. The thermometers are placed about 5 feet above the ground; the exposure is representataive of the surrounding area. At times, temperatures will be lower nearer the ground and in areas that are subject to extreme air drainage on calm nights.

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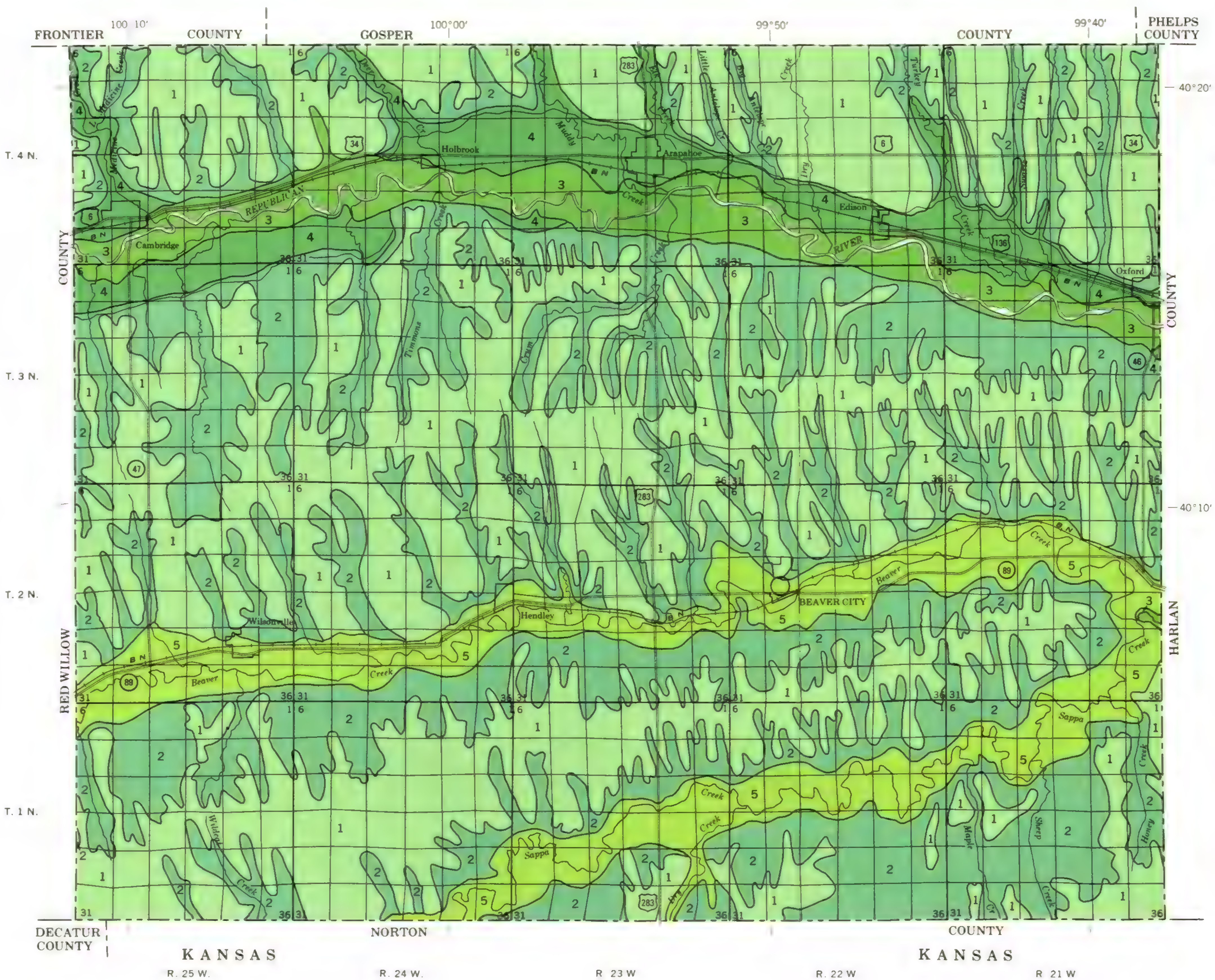


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

UNIVERSITY OF NEBRASKA CONSERVATION AND SURVEY DIVISION

GENERAL SOIL MAP

FURNAS COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 4 Miles

SOIL ASSOCIATIONS *

1 Holdrege–Uly association: Deep, nearly level to strongly sloping, well drained silty soils; on divides of loess mantled uplands

2 Coly–Uly–Holdrege association: Deep, gently sloping to very steep, somewhat excessively drained and well drained silty soils; on divides and side slopes of loess mantled uplands

3 Gibbon–McCook–Inavale association: Deep, nearly level, somewhat poorly drained, moderately well drained and somewhat excessively drained silty, loamy, and sandy soils; on bottom lands

4 Hord–Cozad association: Deep, nearly level and very gently sloping, well drained silty soils; on stream terraces and foot slopes

5 Hord–Hobbs–Cozad association: Deep, nearly level to gently sloping, well drained silty soils; on stream terraces, bottom lands, and foot slopes

* Texture refers to surface layer of the major soils.

Compiled 1977

N

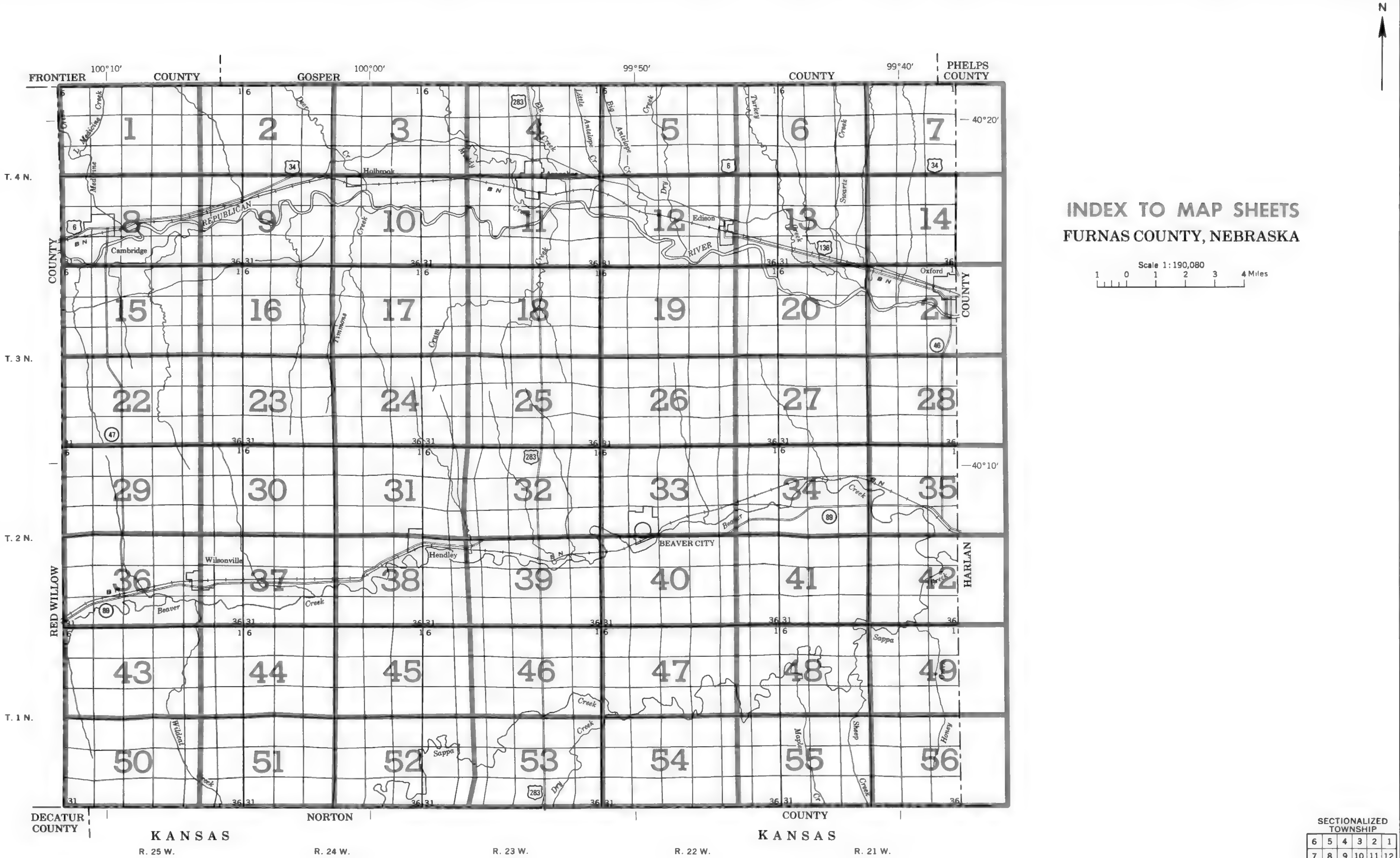
SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
FURNAS COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 4 Miles



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state or province

County or parish

Minor civil division

Reservation (national forest or park, state forest or park, and large airport)

Land grant

Limit of soil survey (label)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool

Davis Airstrip

FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

Divided (median shown if scale permits)

Other roads

Trail

ROAD EMBLEMS & DESIGNATIONS

Interstate

Federal

State

County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

Without road

With road

With railroad

DAMS

Large (to scale)

Medium or small — water / w

PITS

Gravel pit

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

Indian mound (label) — Indian Mound

Located object (label) — Tower

Tank (label) — GAS

Wells, oil or gas

Windmill

Kitchen midden

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

Canals or ditches

Double-line (label) — CANAL

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial — water / w

Intermittent — int / i

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Spring

Well, artesian

Well, irrigation

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CaA FoB2

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

Blowout

Clay spot

Gravelly spot

Gumbo, slick or scabby spot (sodic)

Dumps and other similar non soil areas

Prominent hill or peak

Rock outcrop (includes sandstone and shale)

Saline spot

Sandy spot

Severely eroded spot

Slide or slip (tips point upslope)

Stony spot, very stony spot

Gravel pit — G.P.

SOIL LEGEND

The first capital letter is the initial one of the soil name. The lower case letter that follows separates mapping units having names that begin with the same letter except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are those soils that are level or nearly level. A final number 2 indicates the soil is eroded.

SYMBOL	NAME
An	Anselmo fine sandy loam, 0 to 2 percent slopes
Bn	Barney soils, 0 to 2 percent slopes
CcF	Campus–Canyon loams, 9 to 30 percent slopes
CbE2	Coly silt loam, 9 to 15 percent slopes, eroded
CbG	Coly silt loam, 30 to 60 percent slopes
CkE2	Coly–Nuckolls silt loams, 9 to 15 percent slopes, eroded
CkF	Coly–Nuckolls silt loams, 9 to 30 percent slopes
CmC2	Coly–Uly silt loams, 3 to 9 percent slopes, eroded
CmF	Coly–Uly silt loams, 9 to 30 percent slopes
Co	Cozad silt loam, 0 to 1 percent slopes
CoB	Cozad silt loam, 1 to 3 percent slopes
CoC	Cozad silt loam, 3 to 6 percent slopes
Fm	Fillmore silty clay loam, 0 to 1 percent slopes
Gg	Gibbon silt loam, 0 to 2 percent slopes
Gs	Gibbon silt loam, saline, 0 to 2 percent slopes
Ha	Hall silt loam, 0 to 1 percent slopes
Hb	Hobbs silt loam, 0 to 2 percent slopes
Hc	Hobbs silt loam, channeled, 0 to 2 percent slopes
Hm	Hobbs–McCook silt loams, 0 to 2 percent slopes
Ho	Holdrege silt loam, 0 to 1 percent slopes
HoB	Holdrege silt loam, 1 to 3 percent slopes
HoC	Holdrege silt loam, 3 to 6 percent slopes
HoC2	Holdrege silt loam, 3 to 6 percent slopes, eroded
HpB2	Holdrege–Coly silt loams, 1 to 3 percent slopes, eroded
HpC2	Holdrege–Coly silt loams, 3 to 6 percent slopes, eroded
Hr	Hord silt loam, 0 to 1 percent slopes
HrB	Hord silt loam, 1 to 3 percent slopes
HrC	Hord silt loam, 3 to 6 percent slopes
In	Inavale soils, 0 to 2 percent slopes
Mc	McCook silt loam, 0 to 2 percent slopes
Mu	Munjor fine sandy loam, 0 to 2 percent slopes
UsB	Uly silt loam, 1 to 3 percent slopes
UsC	Uly silt loam, 3 to 9 percent slopes
Wb	Wann Variant fine sandy loam, 0 to 2 percent slopes

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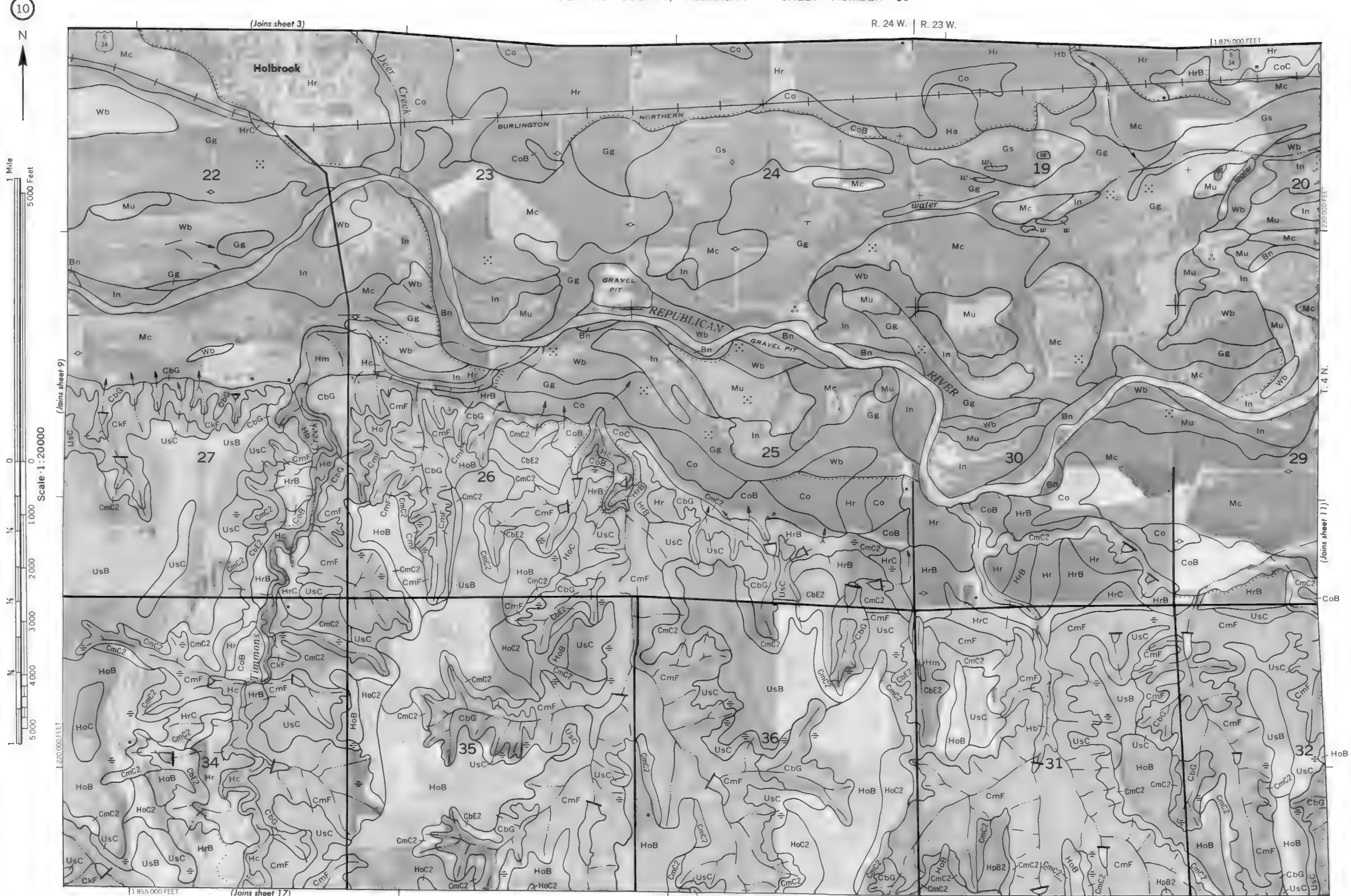

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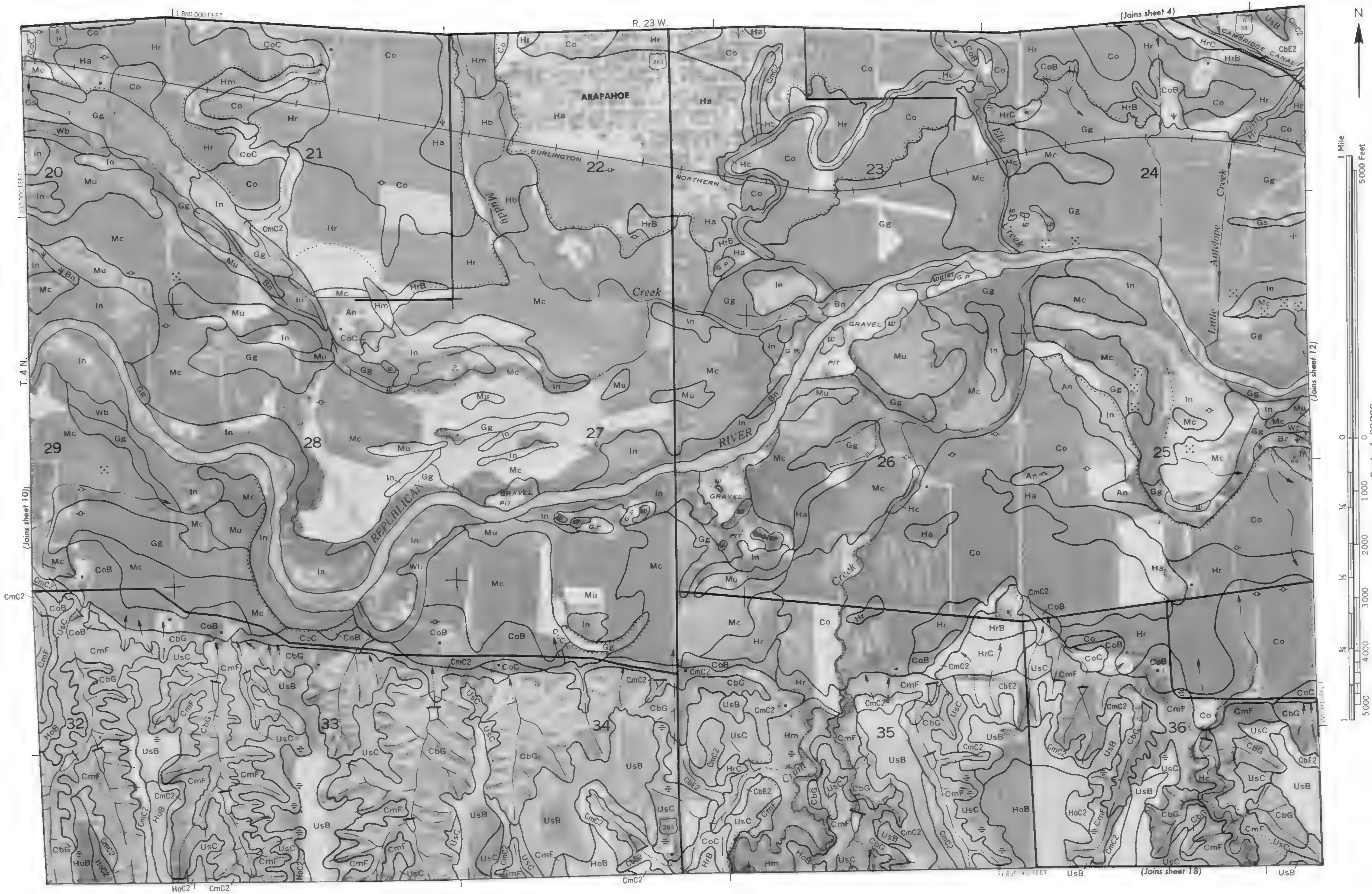

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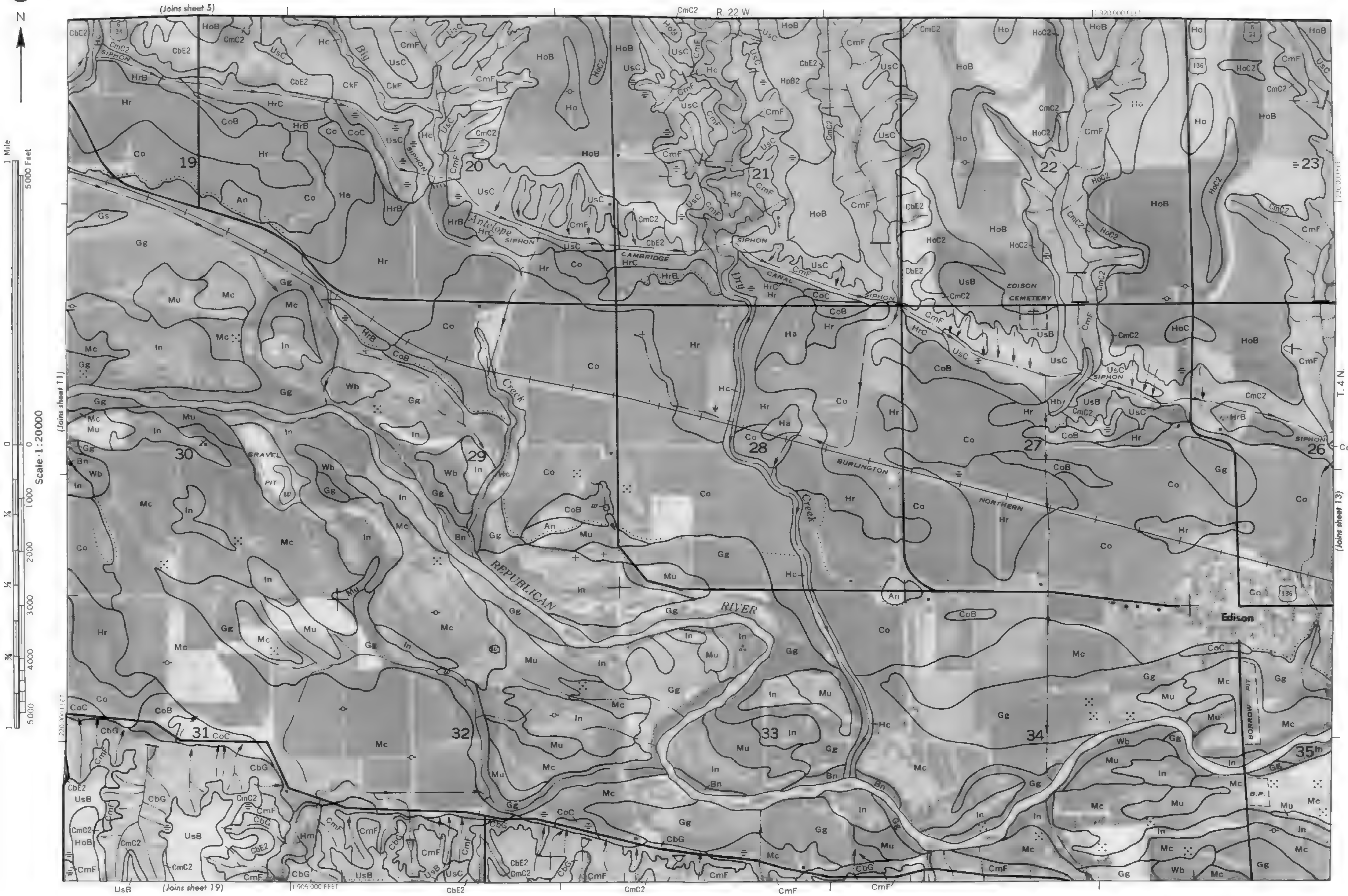

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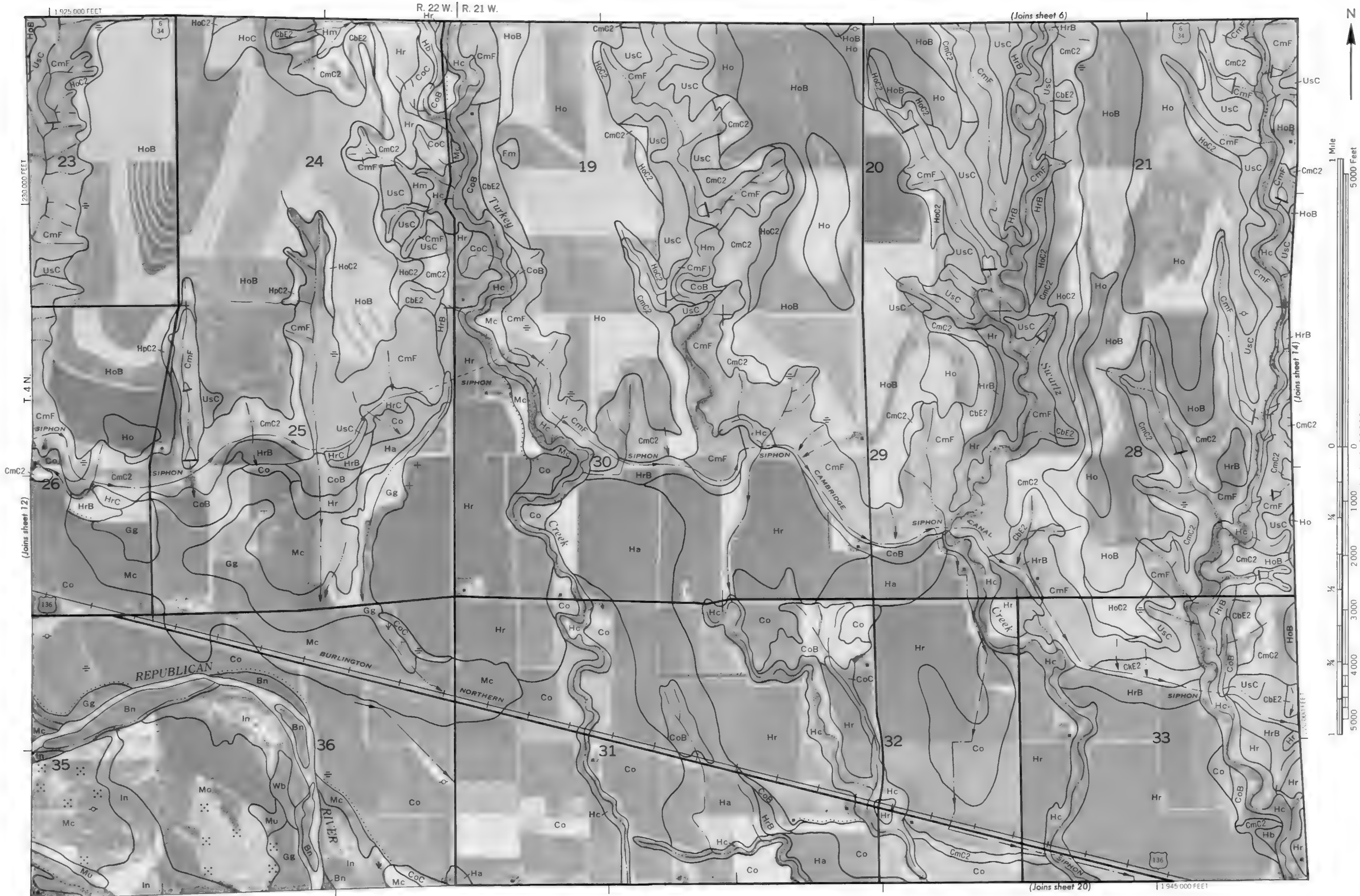

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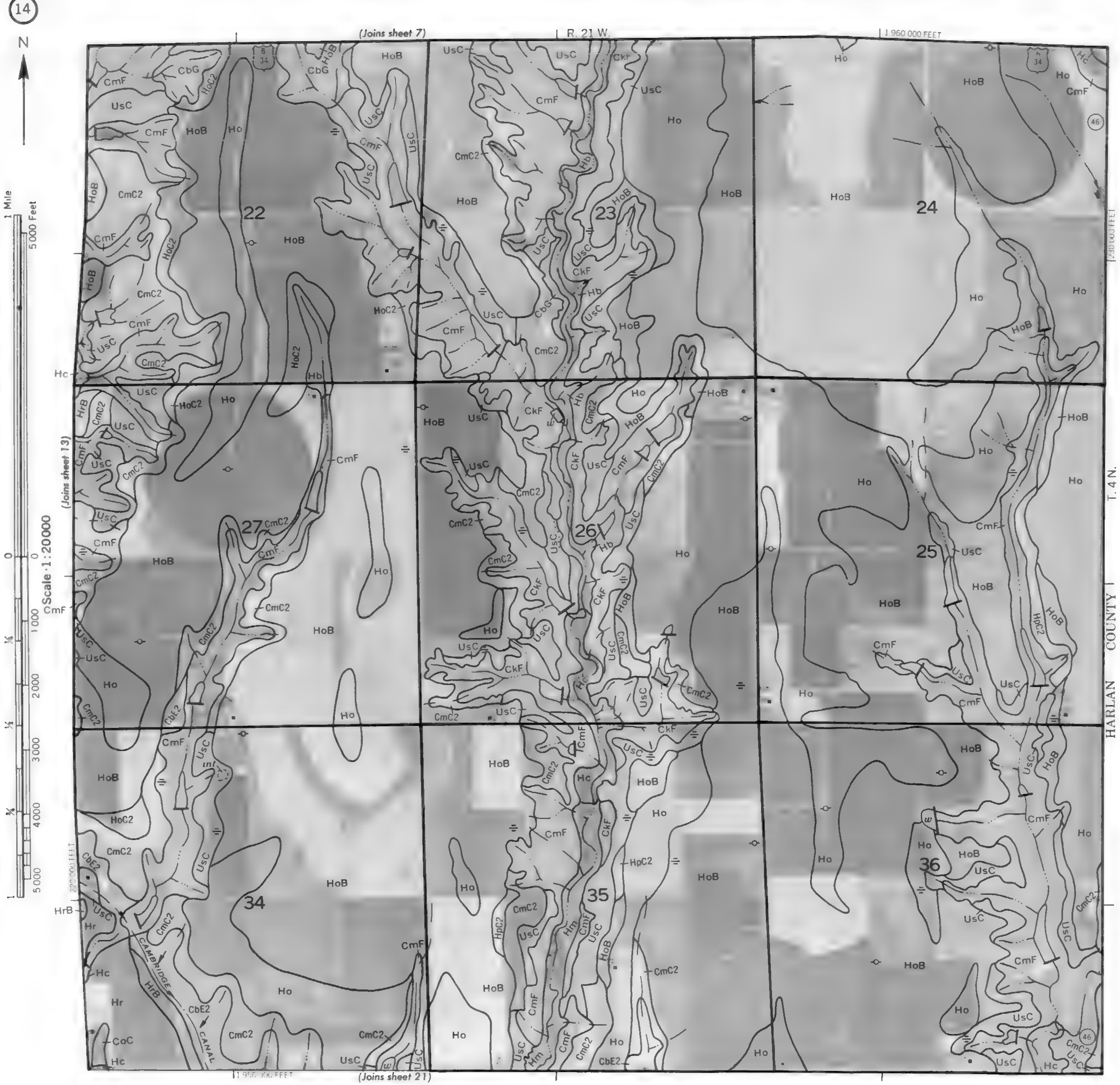

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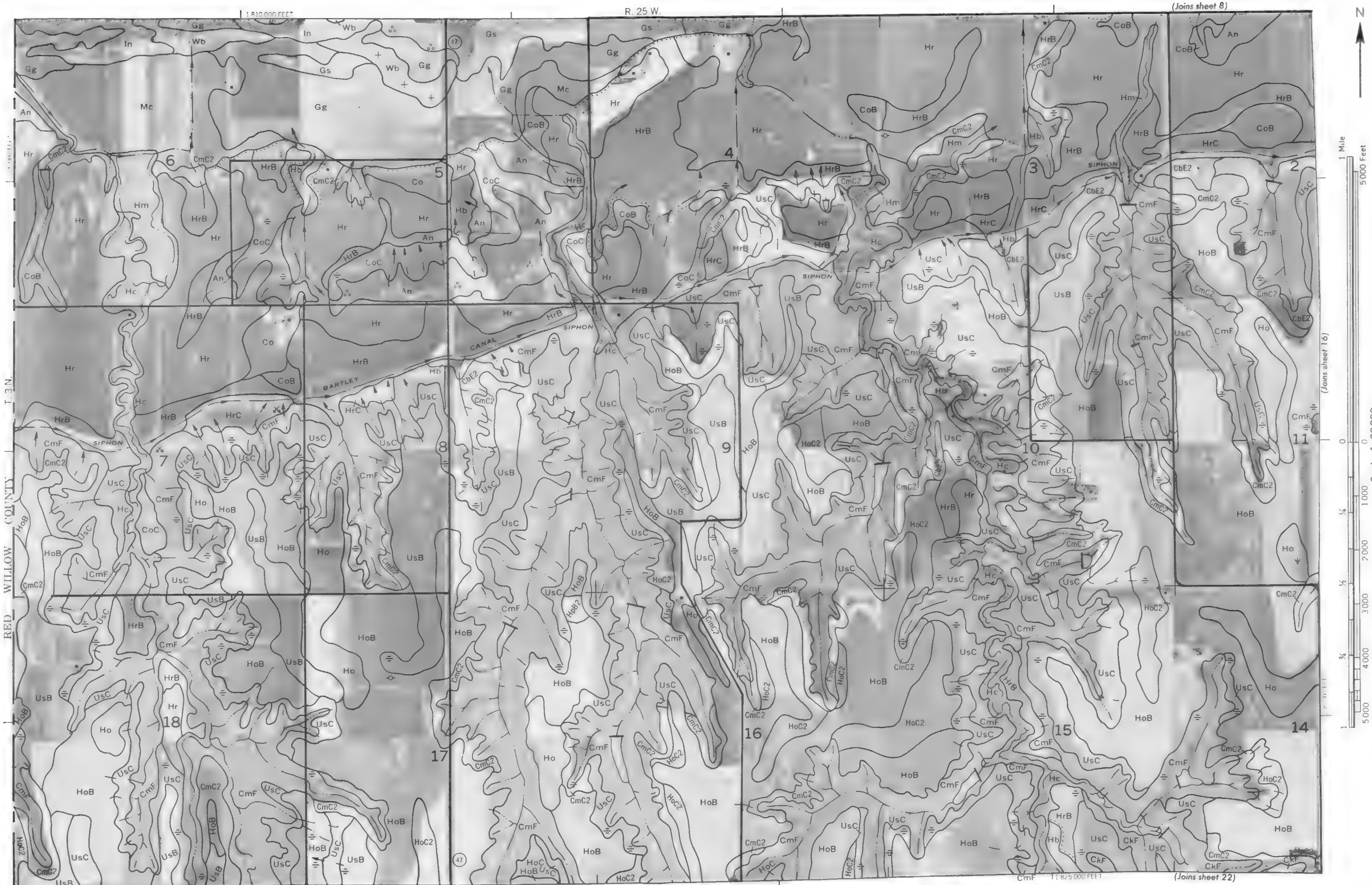
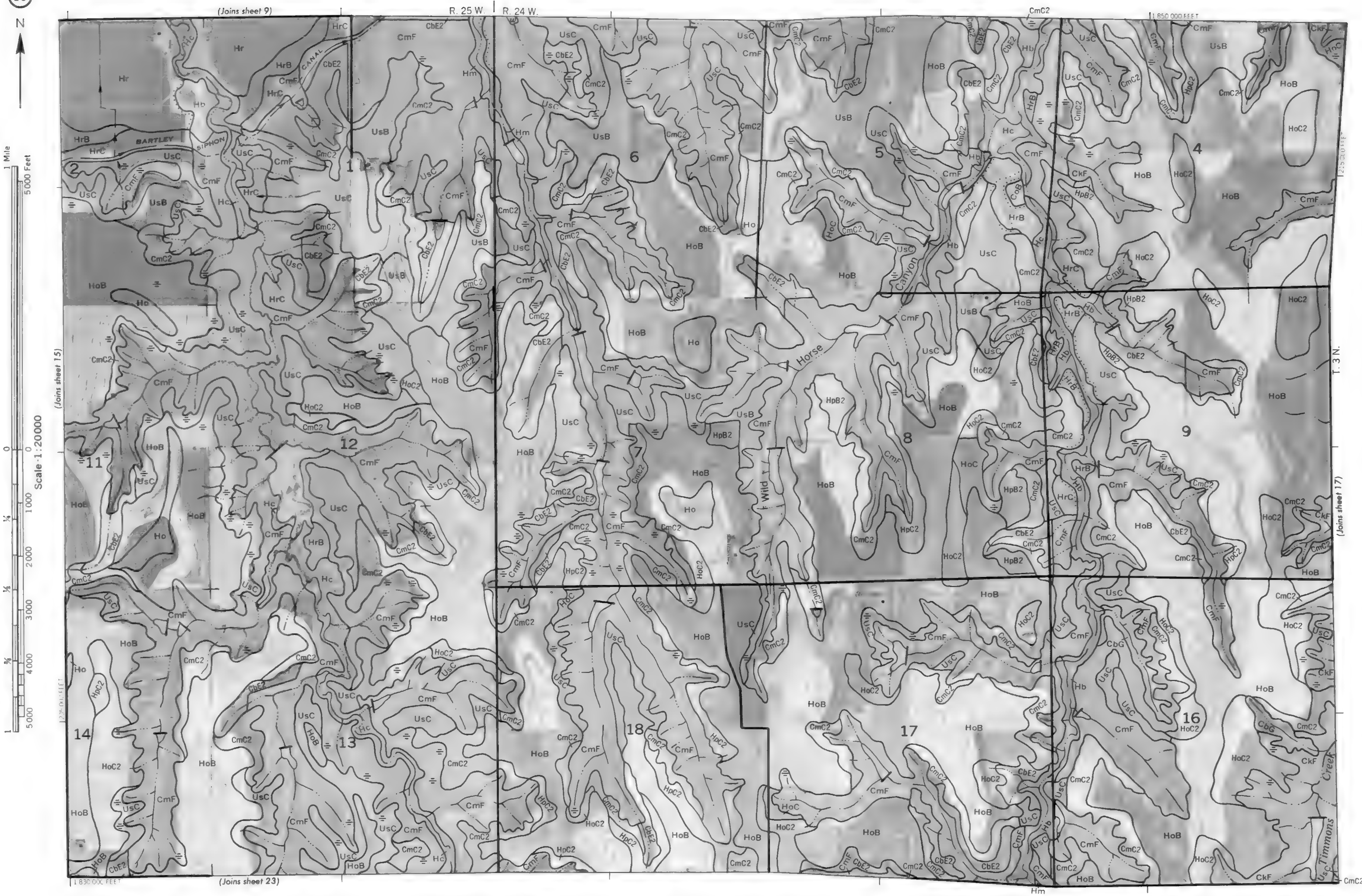
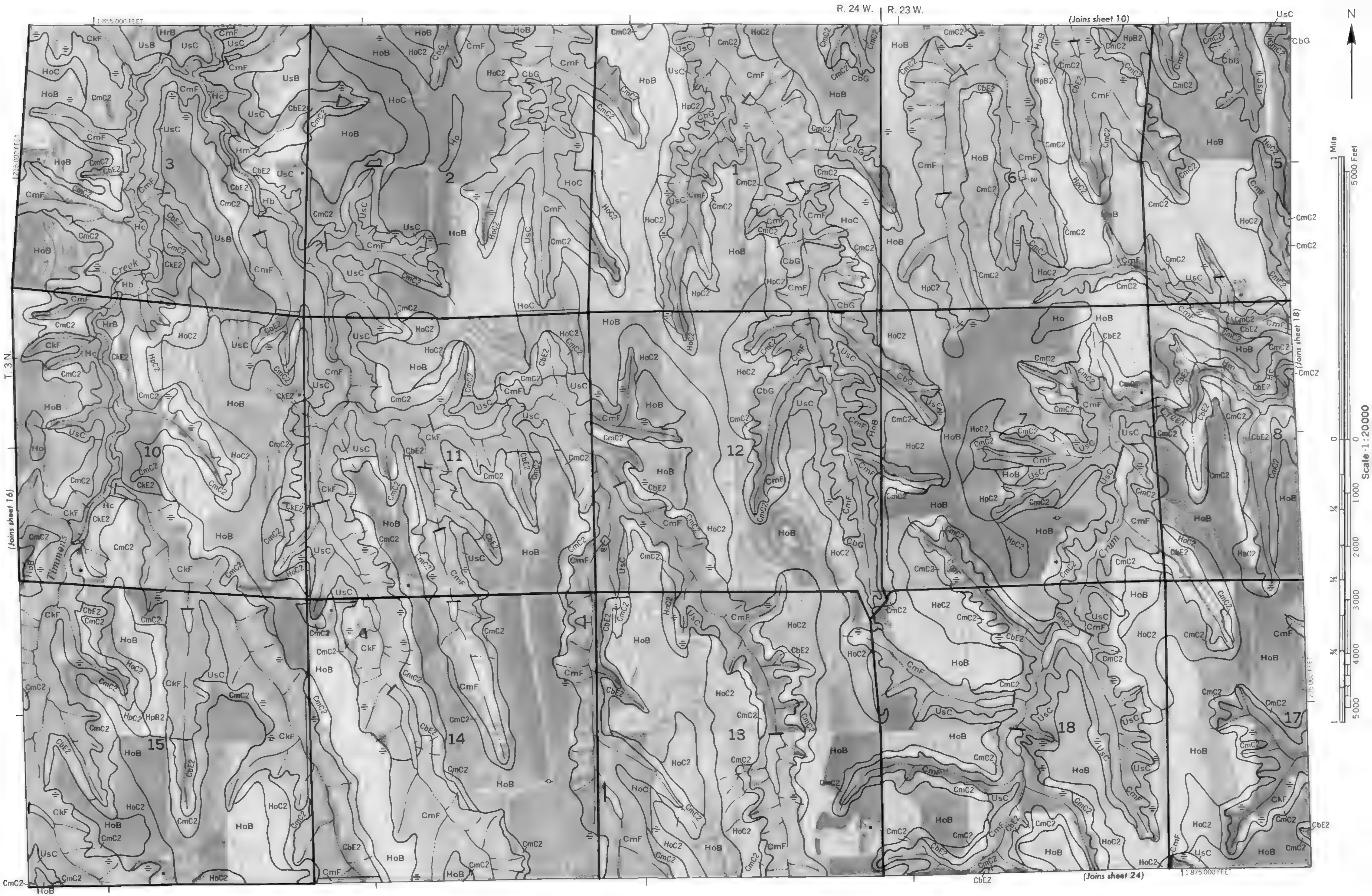
FURNAS COUNTY, NEBRASKA NO. 14


15
N
(Joins sheet 8)
R. 25 W.
1 810 000 FEET
(Joins sheet 16)
(Joins sheet 22)
1 825 000 FEET
T. 3 N.
RED WILLOW COUNTY
BARTLEY CANAL
SIPHON
Scale 1:20000
1 Mile
5000 Feet
FURNAS COUNTY, NEBRASKA NO. 15


N
(Joins sheet 9)
R. 25 W.
R. 24 W.
1 850 000 FEET
T. 3 N.
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 23)
1 830 000 FEET
Scale 1:20000
1 Mile
5000 Feet
BARTLEY
SIPHON
CANAL
Horse
Canyon
Wild
Timmons
Creek
1
2
4
5
6
7
8
9
11
12
13
14
16
17
18



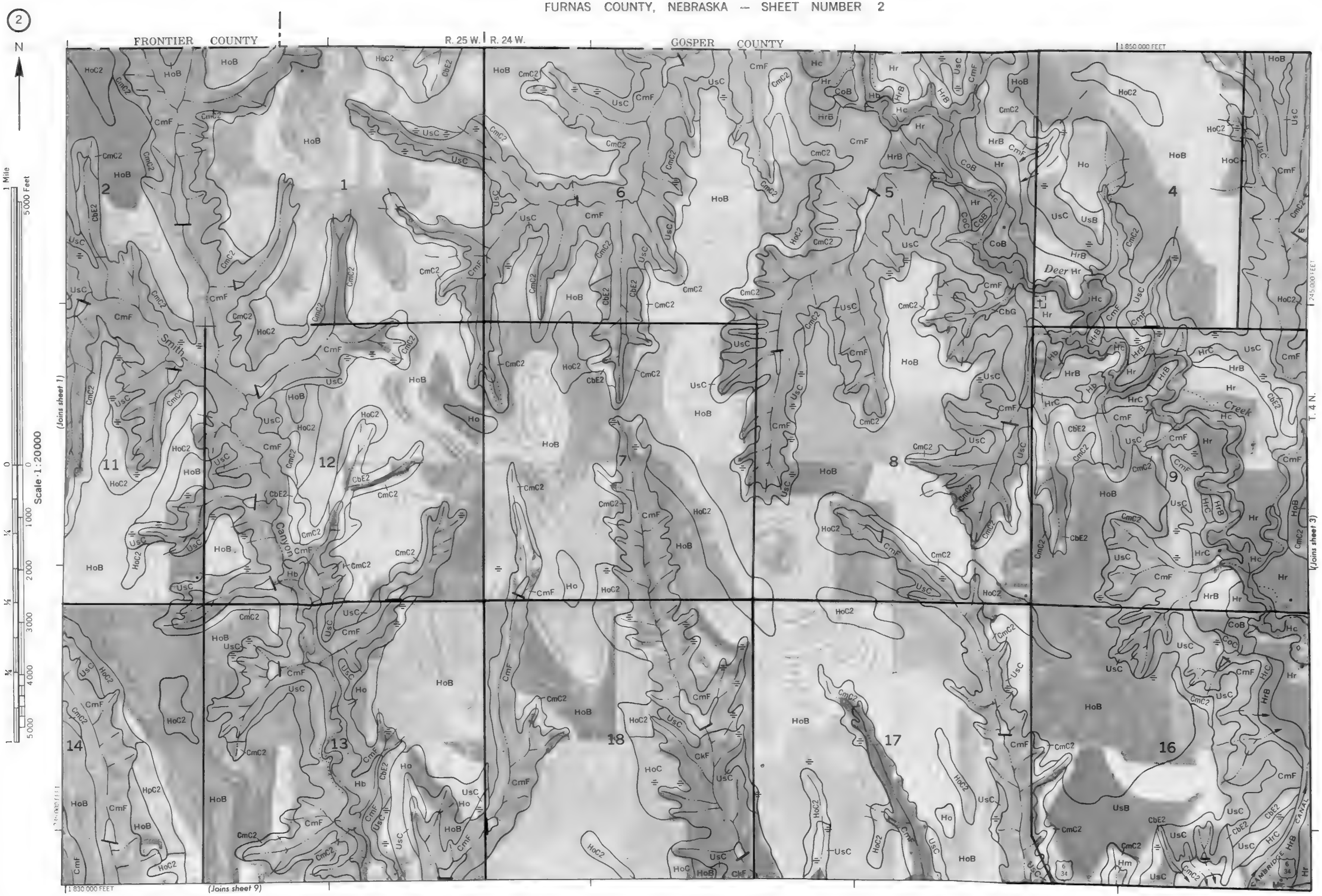
FURNAS COUNTY, NEBRASKA NO. 17

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

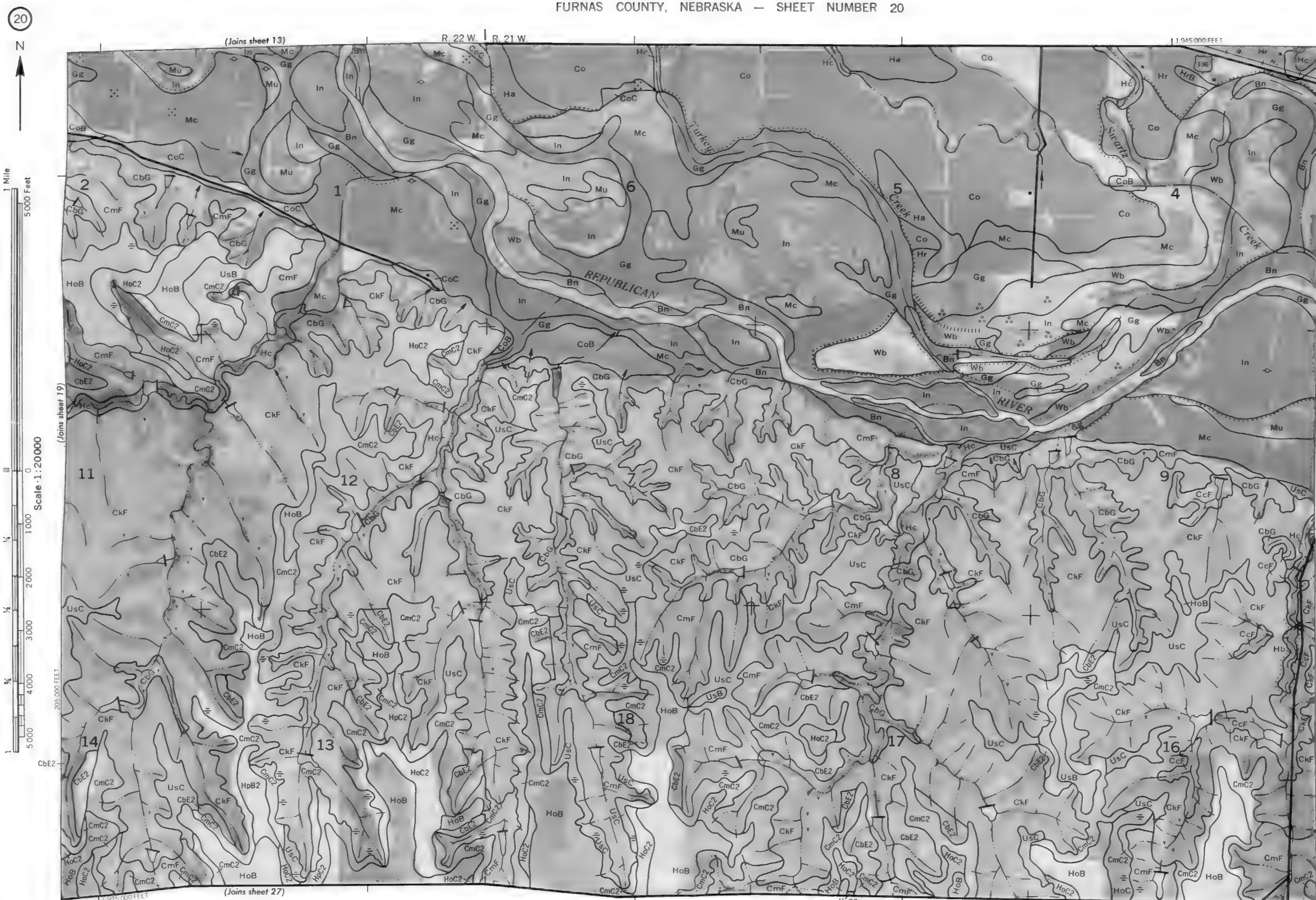
FURNAS COUNTY, NEBRASKA NO. 19

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



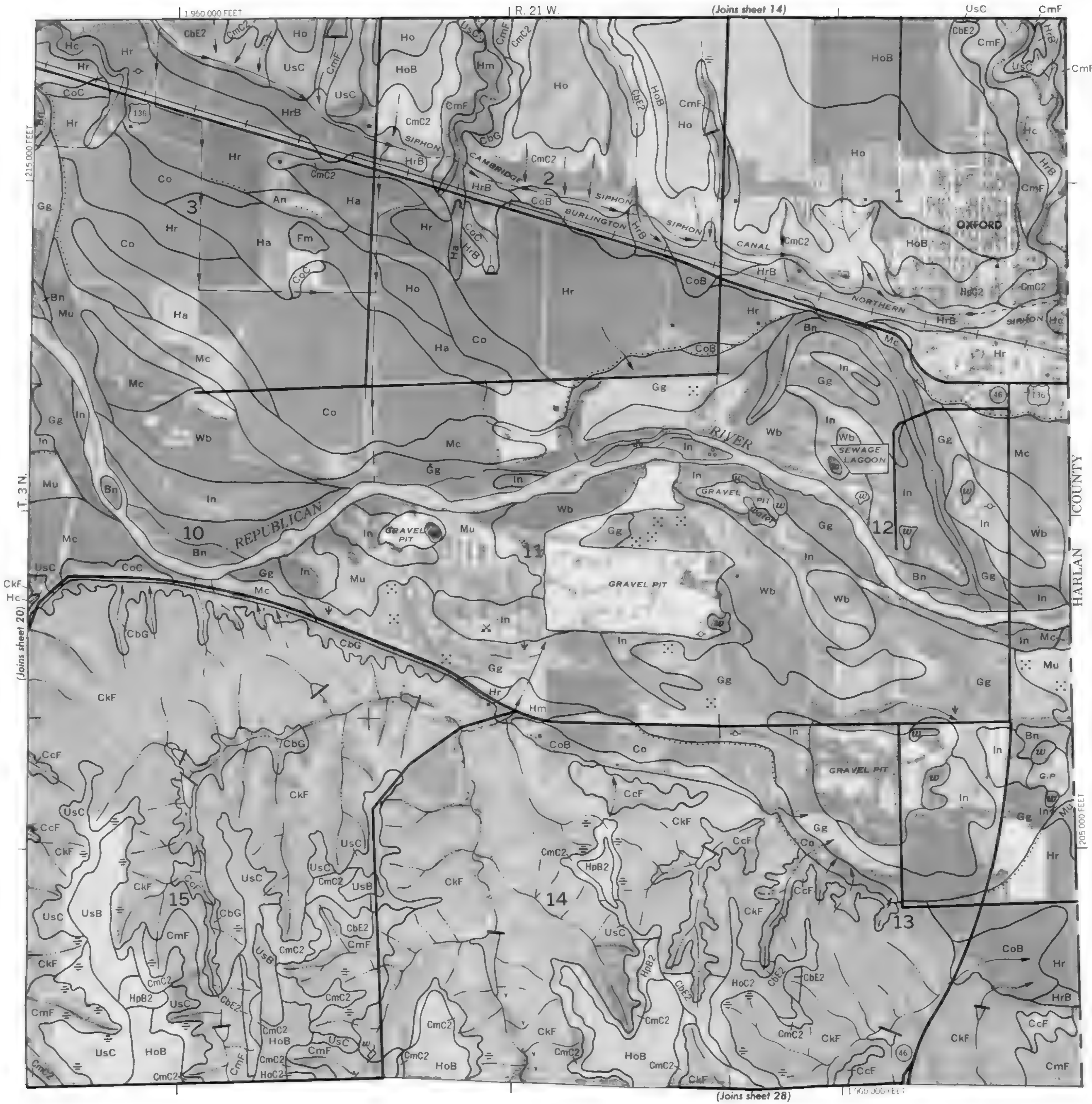
This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 2



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 20



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

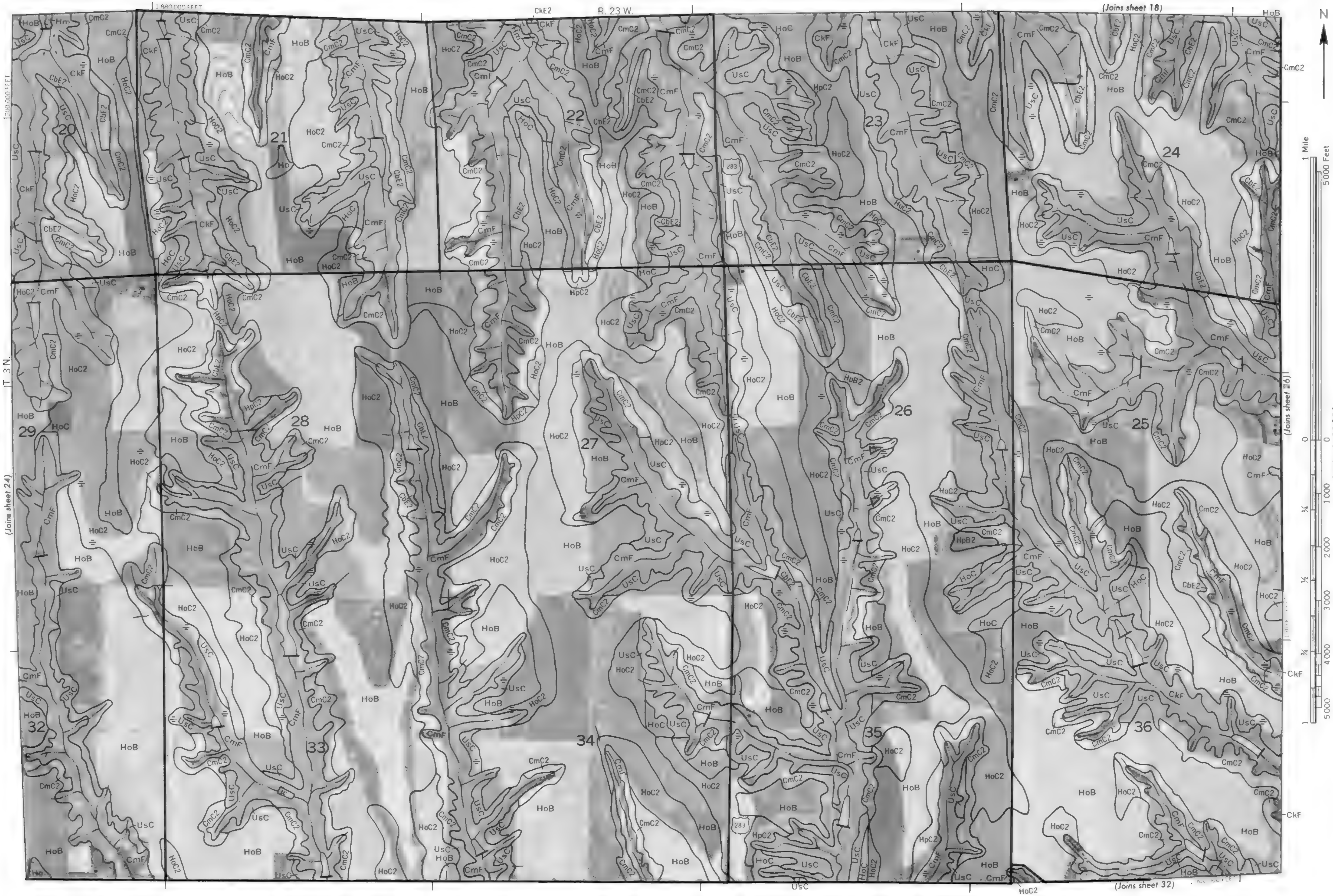
FURNAS COUNTY, NEBRASKA — SHEET NUMBER 22

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 23

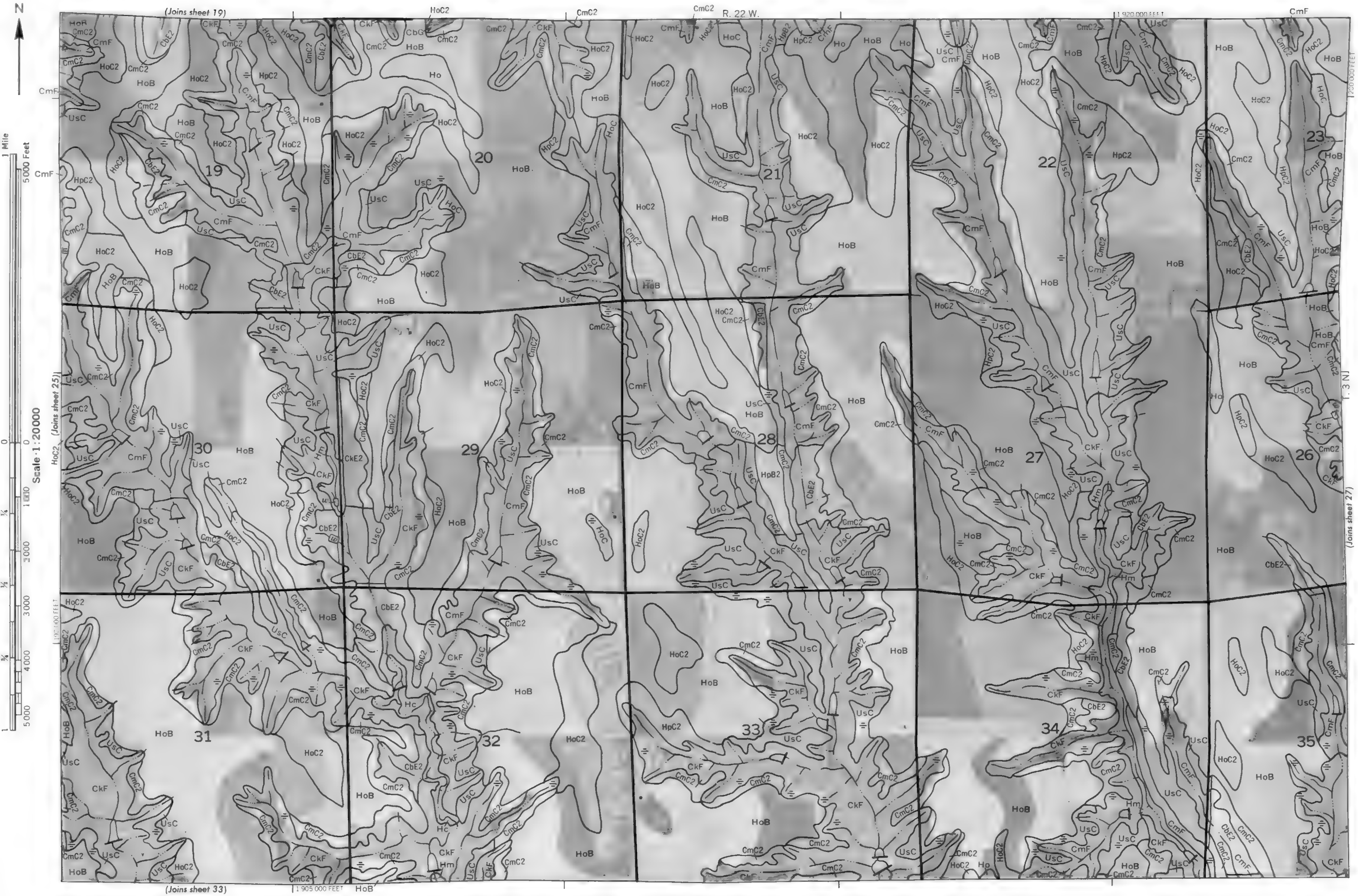
FURNAS COUNTY, NEBRASKA — SHEET NUMBER 24

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

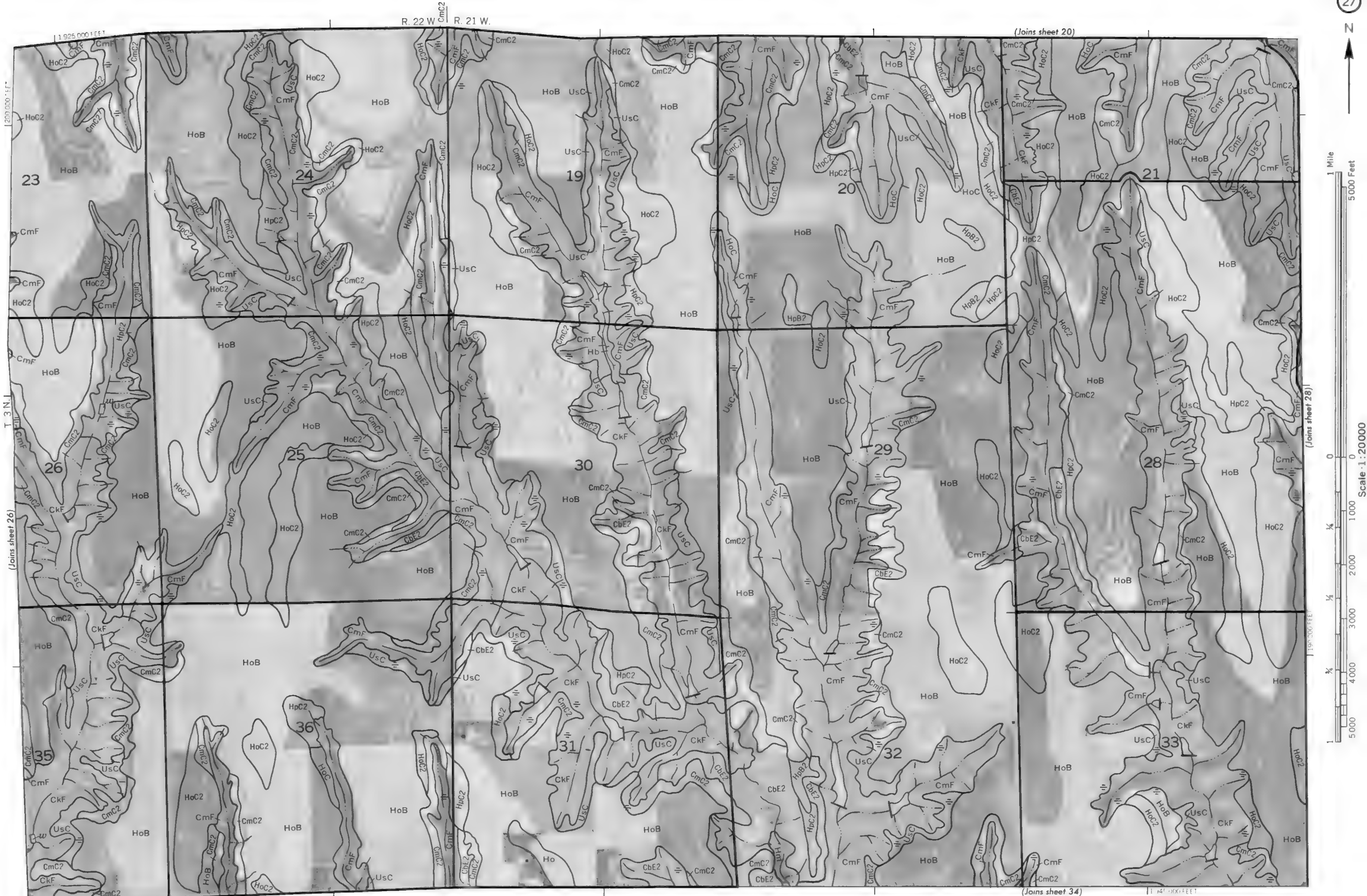


FURNAS COUNTY, NEBRASKA NO. 25

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

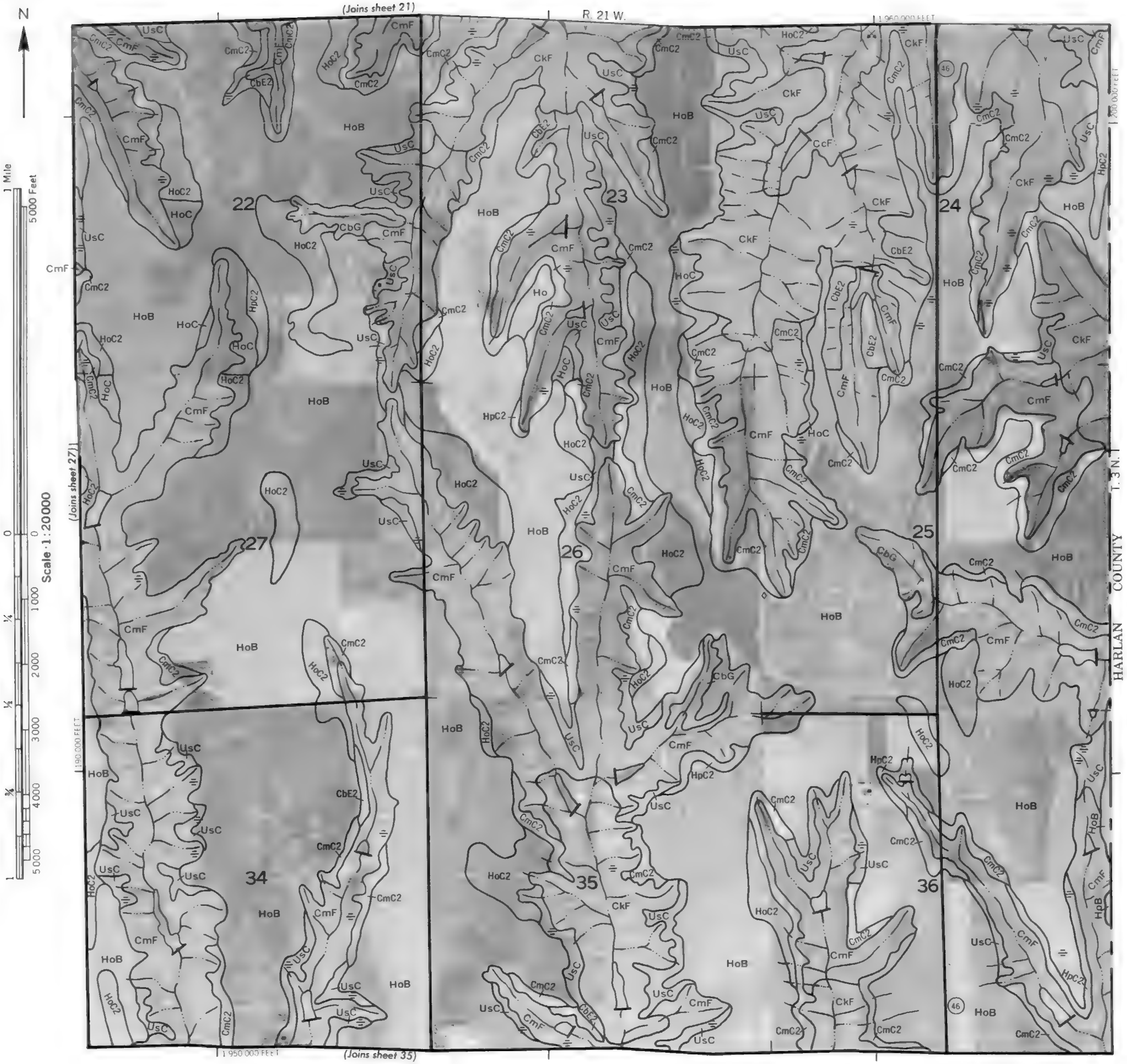


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



FURNAS COUNTY, NEBRASKA NO. 27

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

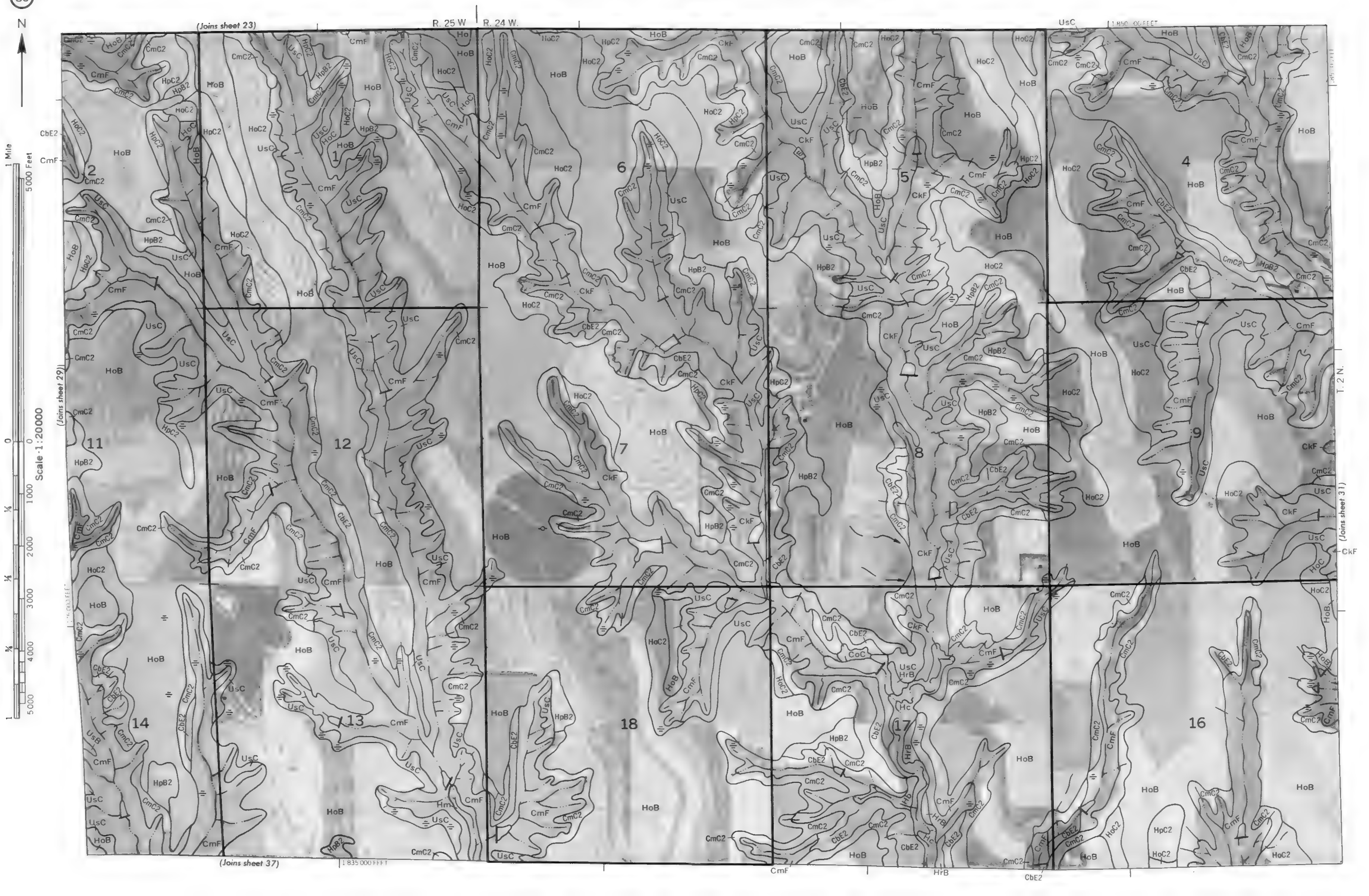


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

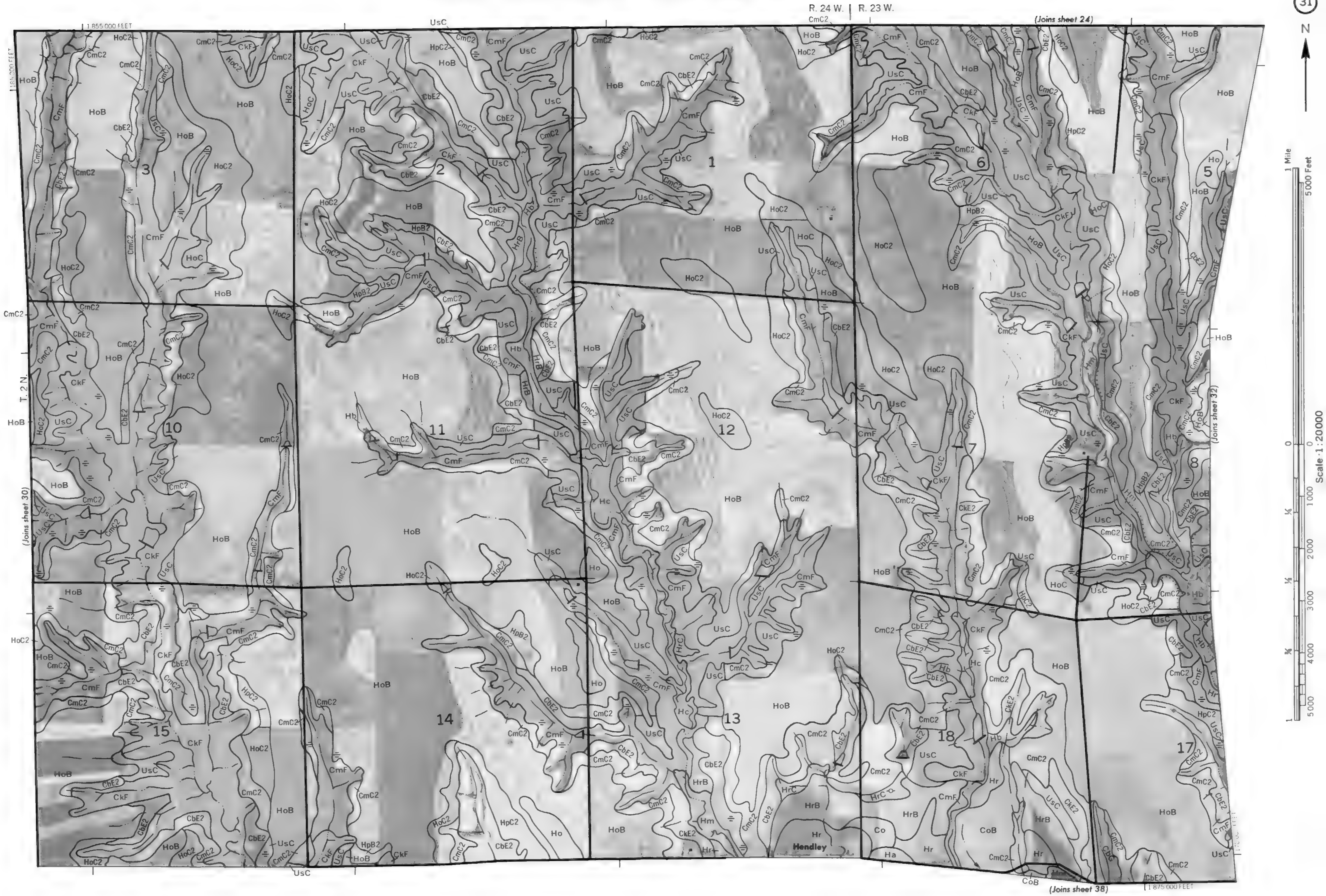

FURNAS COUNTY, NEBRASKA NO. 29
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.
1 810 000 FEET
R. 25 W.
(Joins sheet 22)
(Joins sheet 30)
(Joins sheet 36)
1 830 000 FEET
T. 2 N.
RED WILLOW COUNTY
N
1 Mile
5000 Feet
Scale 1:20000
0
1/4
1/2
3/4
1
1000
2000
3000
4000
5000

FURNAS COUNTY, NEBRASKA NO. 3

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



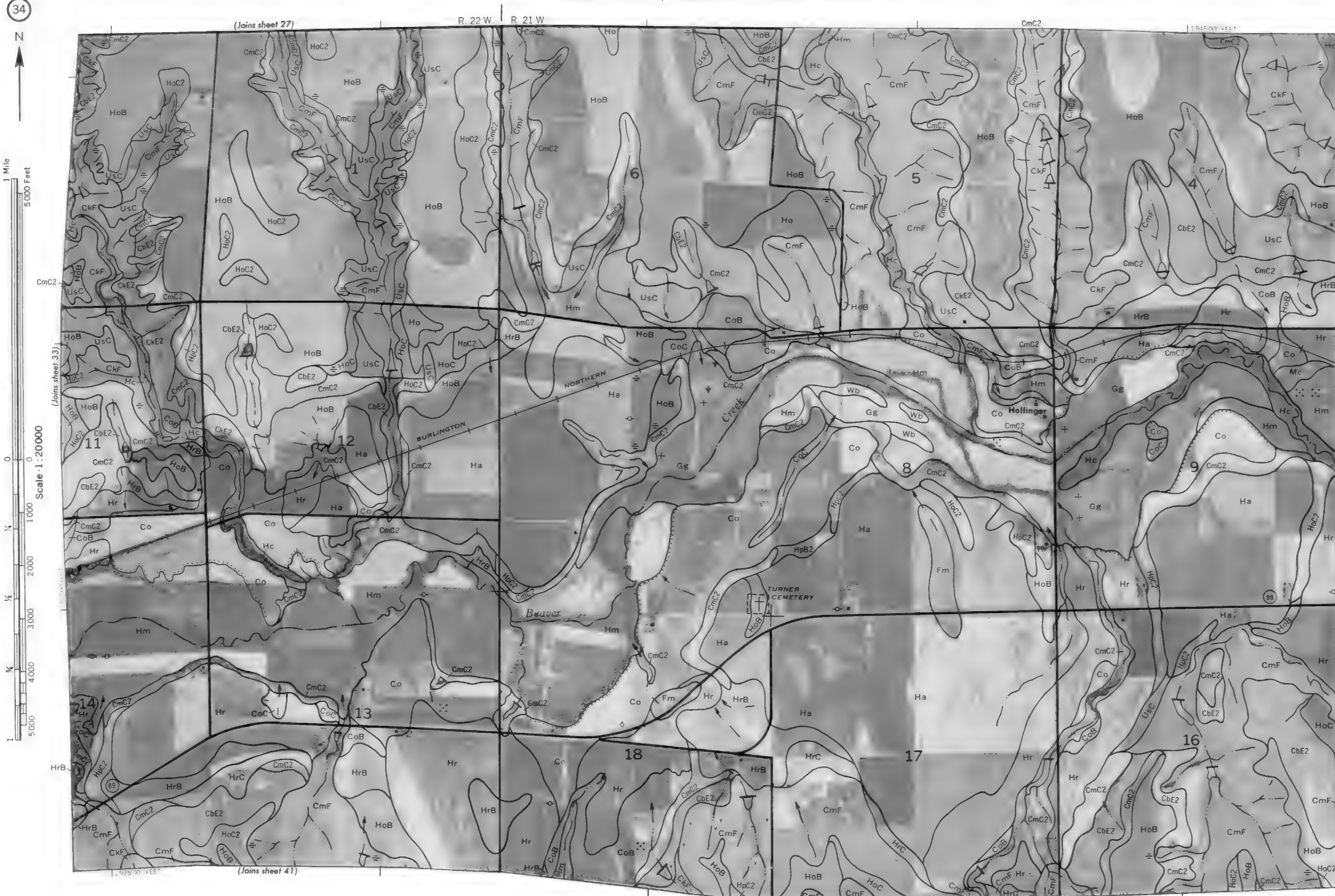
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 32

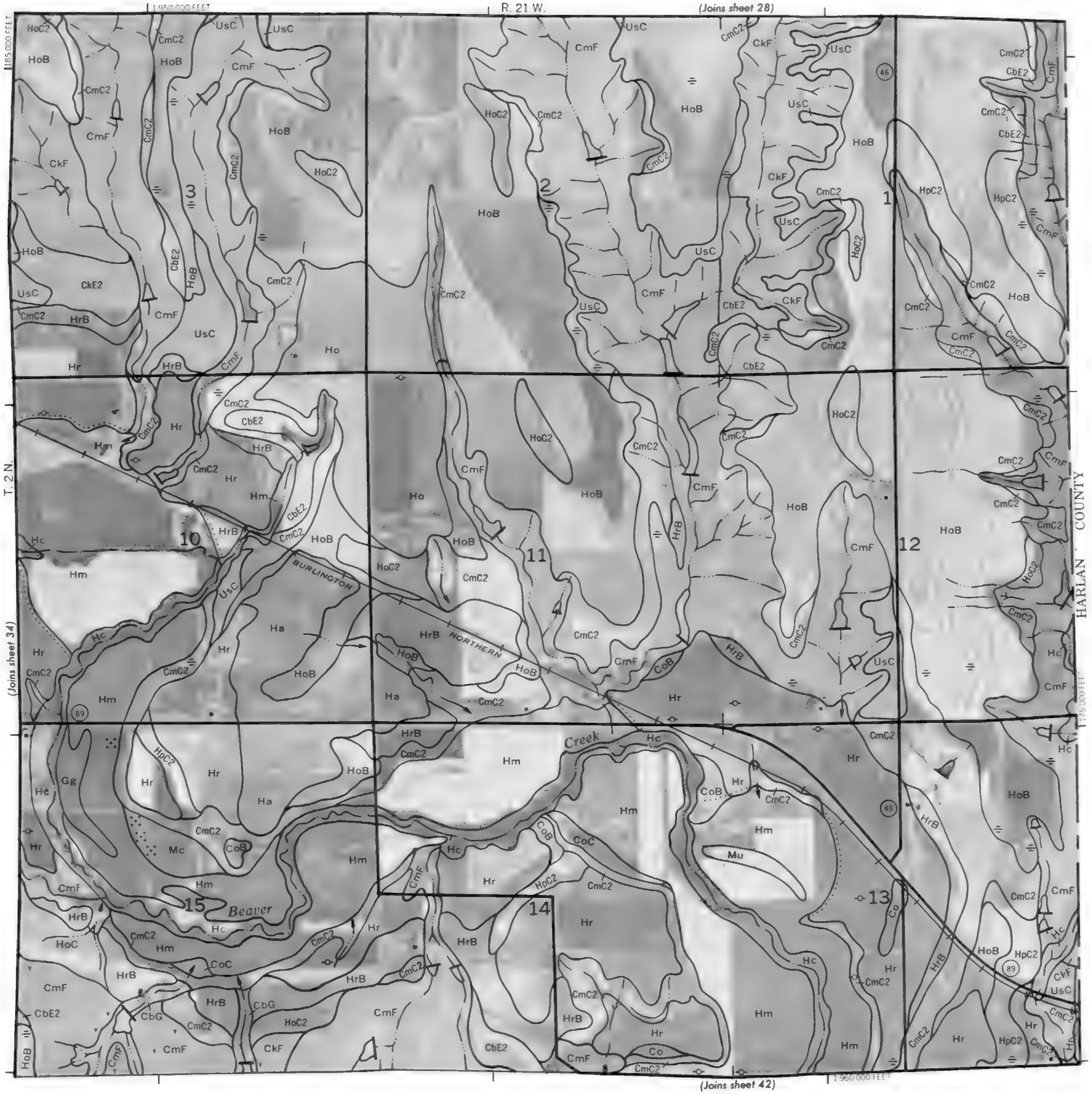
This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 33

This map is compiled on 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


34
N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 27)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 41)
R. 22 W.
R. 21 W.
T. 2 N.
BURLINGTON
NORTHERN
Beaver
Creek
Hollinger
TURNER CEMETERY
89
FURNAS COUNTY, NEBRASKA NO. 34

35



N

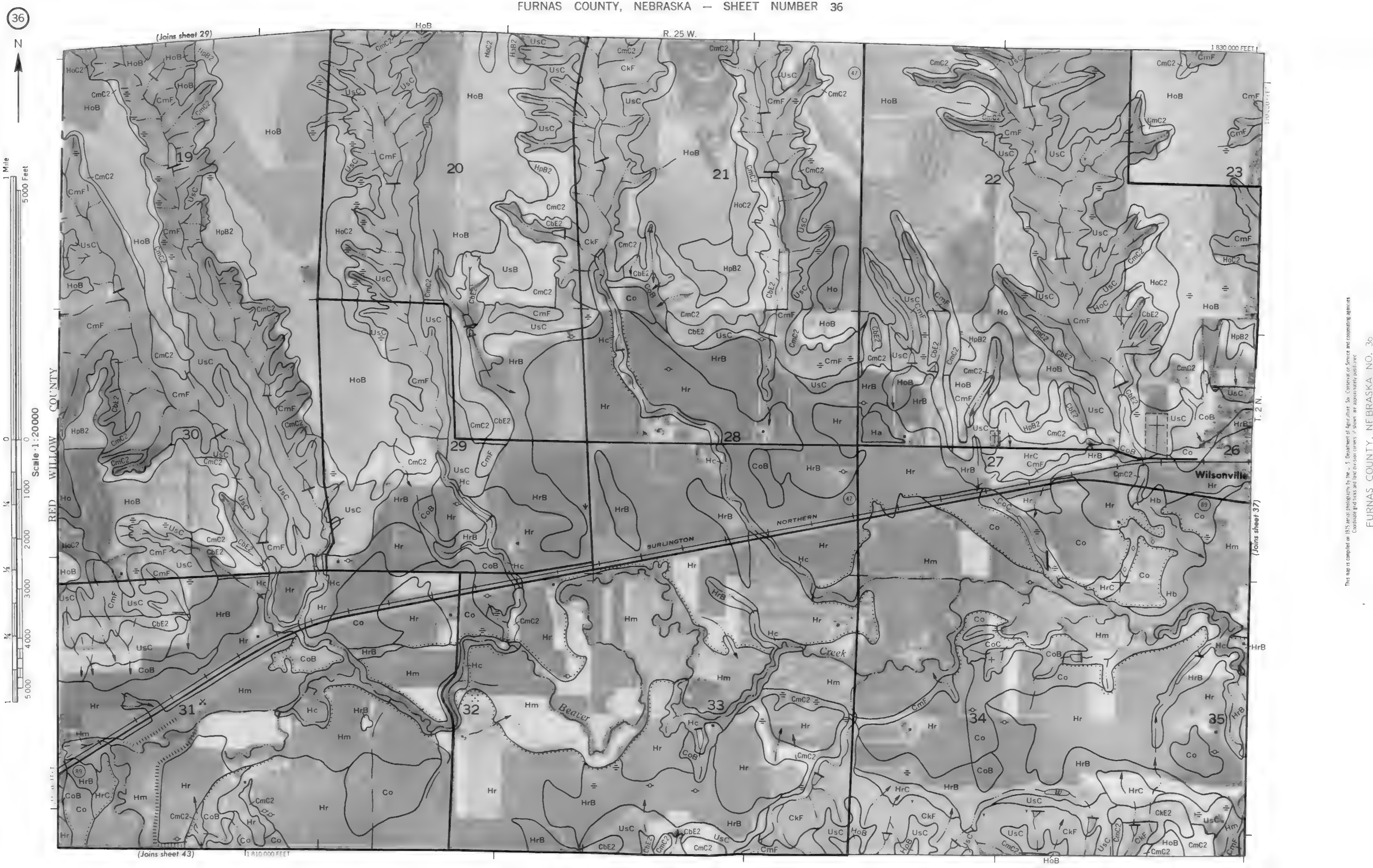
Scale 1:20000

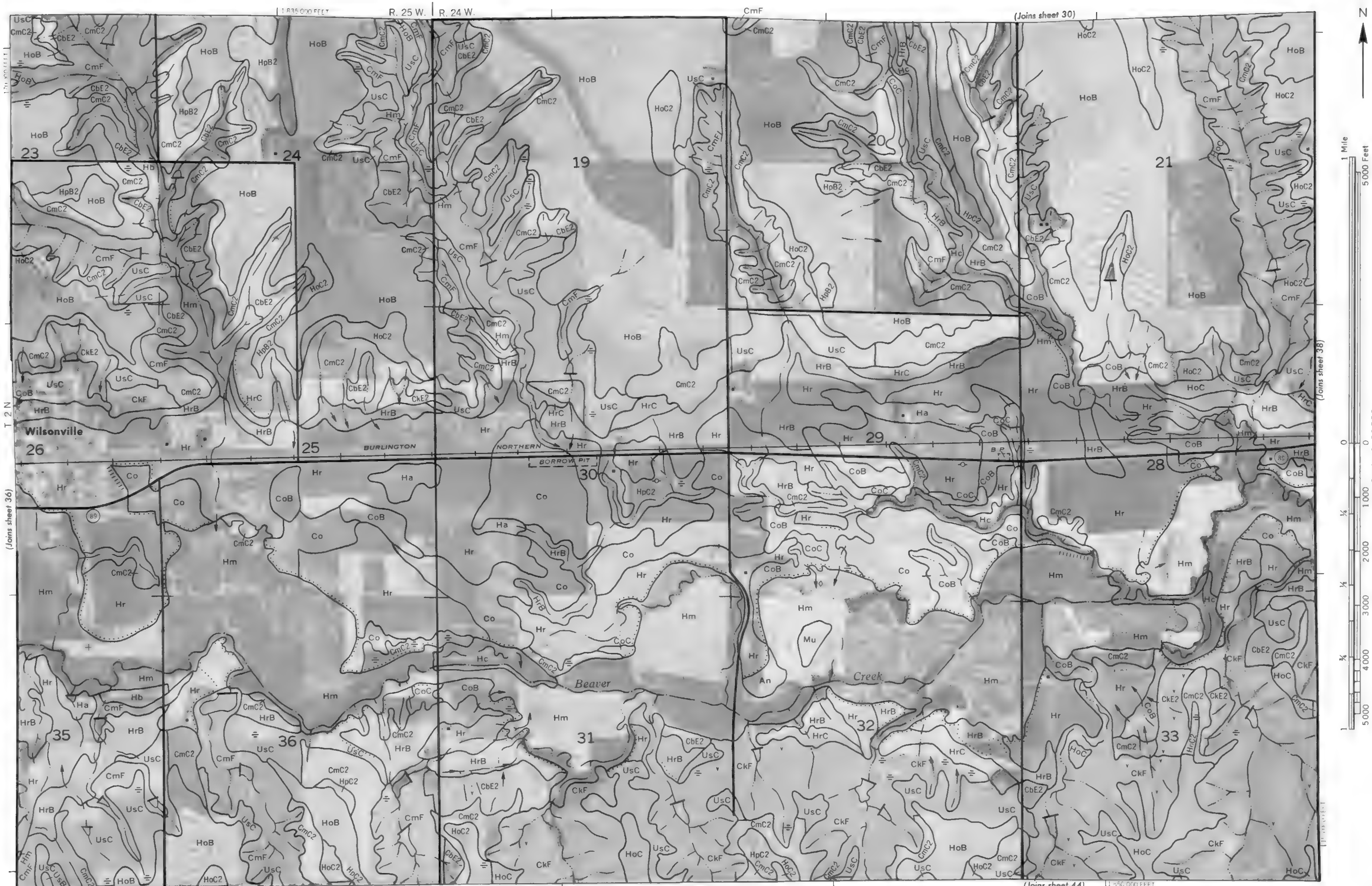
1 Mile

5000 Feet

FURNAS COUNTY, NEBRASKA NO. 35

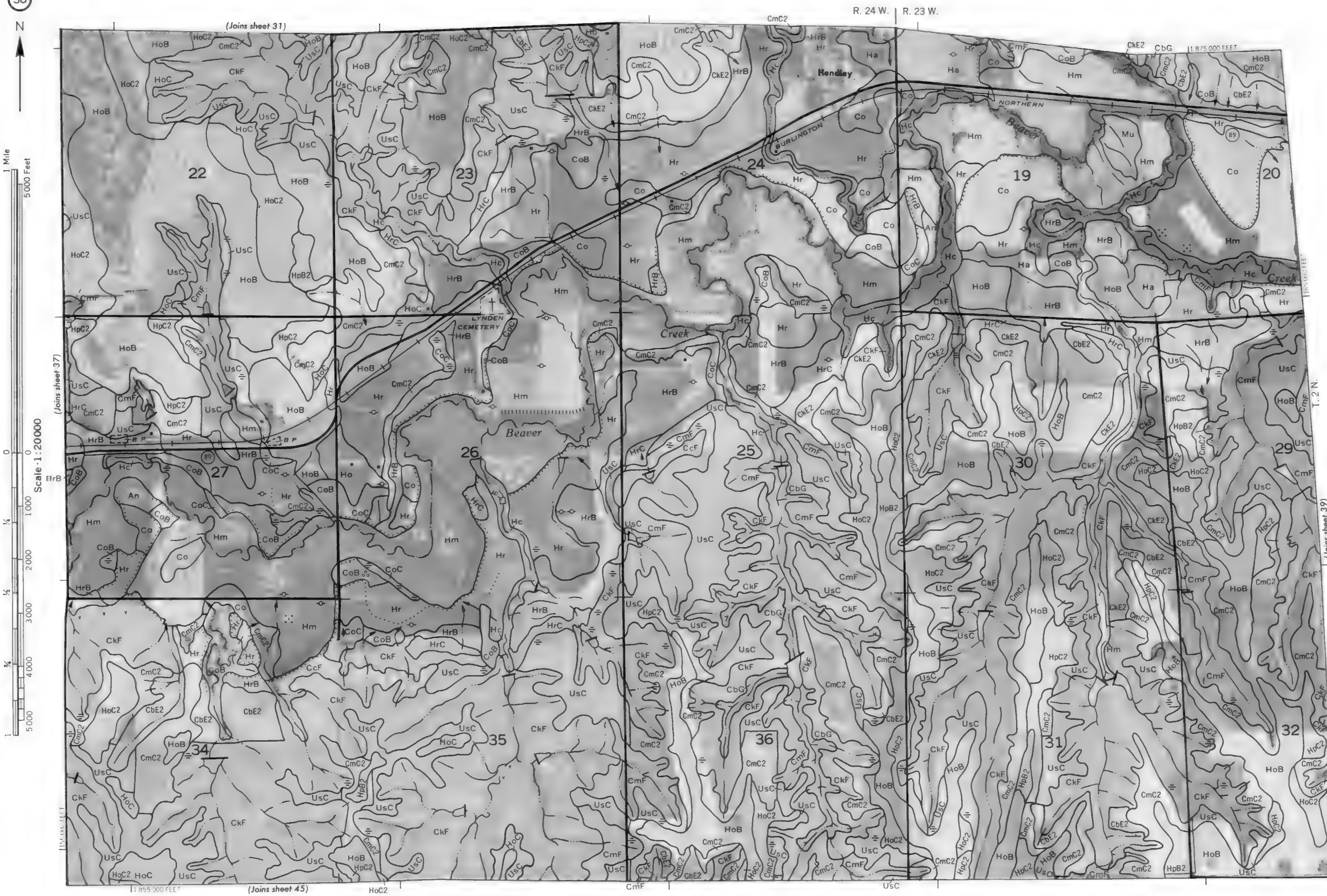
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

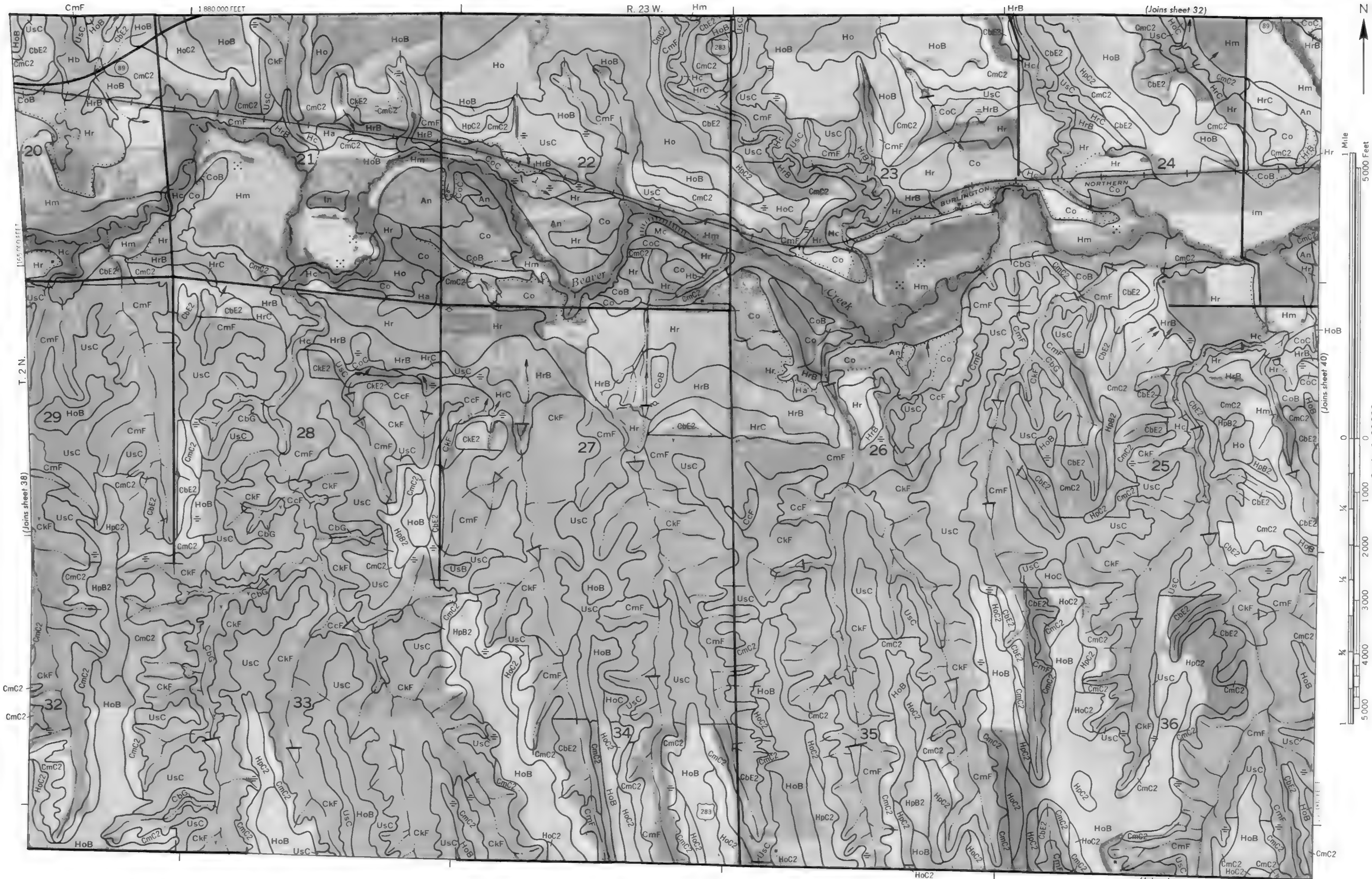

36
N
(Joins sheet 29)
R. 25 W.
1 830 000 FEET
T. 2 N.
(Joins sheet 37)
(Joins sheet 43)
1 810 000 FEET
RED WILLOW COUNTY
Scale 1:20000
1 Mile
5000 Feet
Wilsonville
BURLINGTON NORTHERN
Beaver Creek
19
20
21
22
23
30
29
28
27
26
31
32
33
34
35
FURNAS COUNTY, NEBRASKA NO. 36



FURNAS COUNTY, NEBRASKA NO. 37

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


38
N
(Joins sheet 31)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 45)
R. 24 W.
R. 23 W.
T. 2 N.
Hendley
LYNDEN CEMETERY
BURLINGTON
NORTHERN
Beaver
Creek
89
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
1 Mile
5000 Feet
Scale 1:20000
1 875 000 FEET
1 855 000 FEET



FURNAS COUNTY, NEBRASKA NO. 39

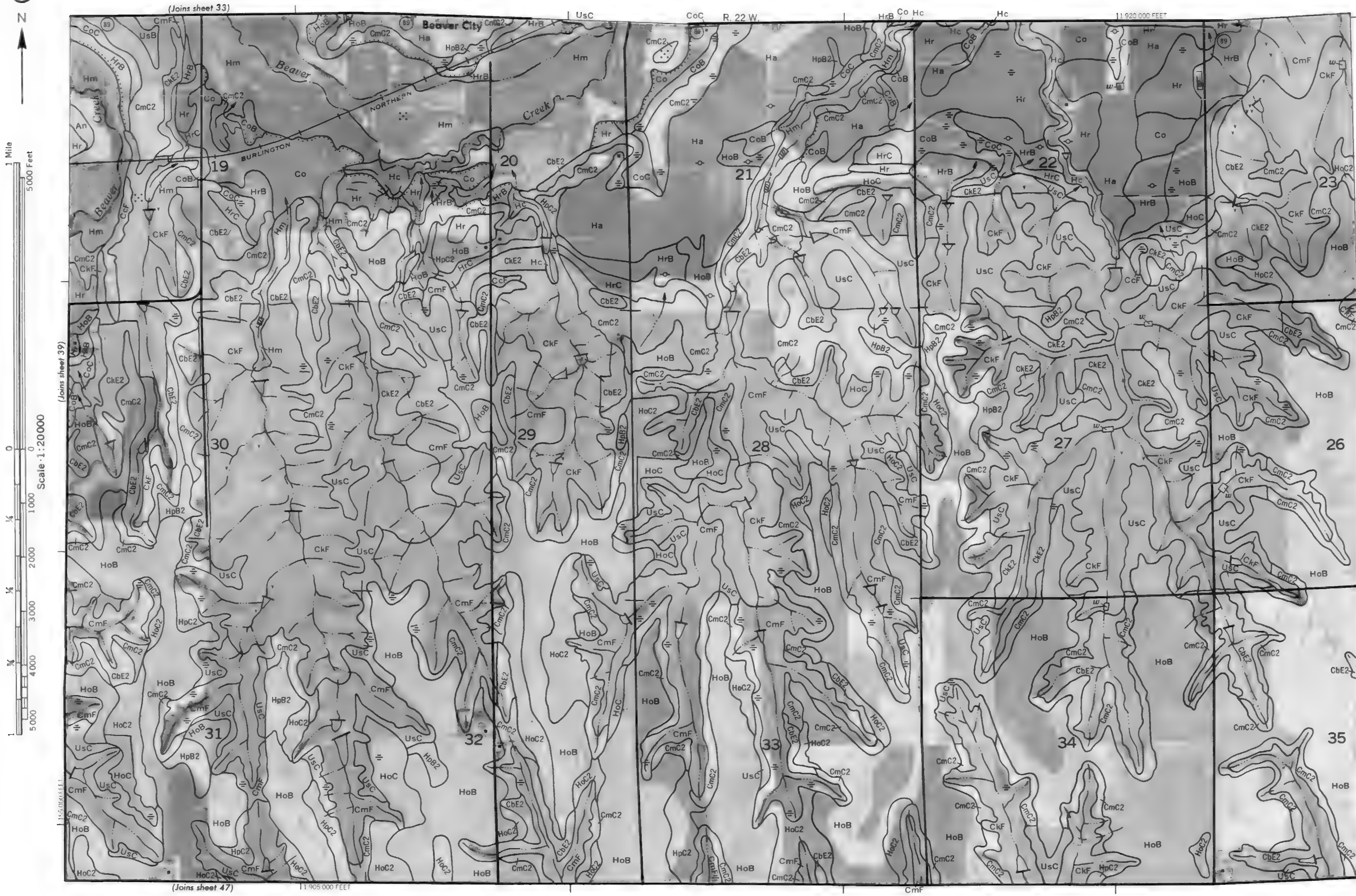
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners if shown are approximately positioned

FURNAS COUNTY, NEBRASKA — SHEET NUMBER 4

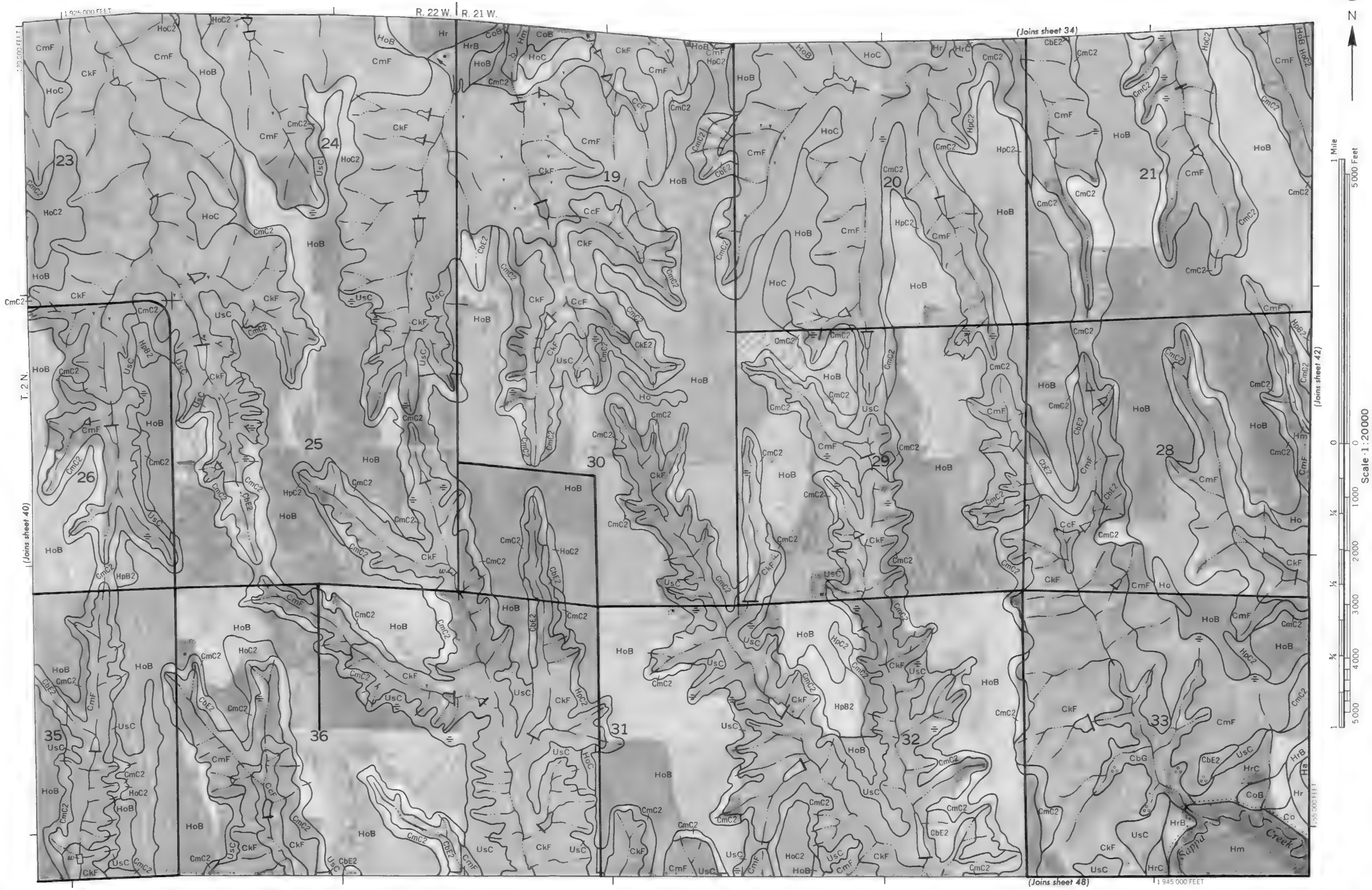
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 4

40

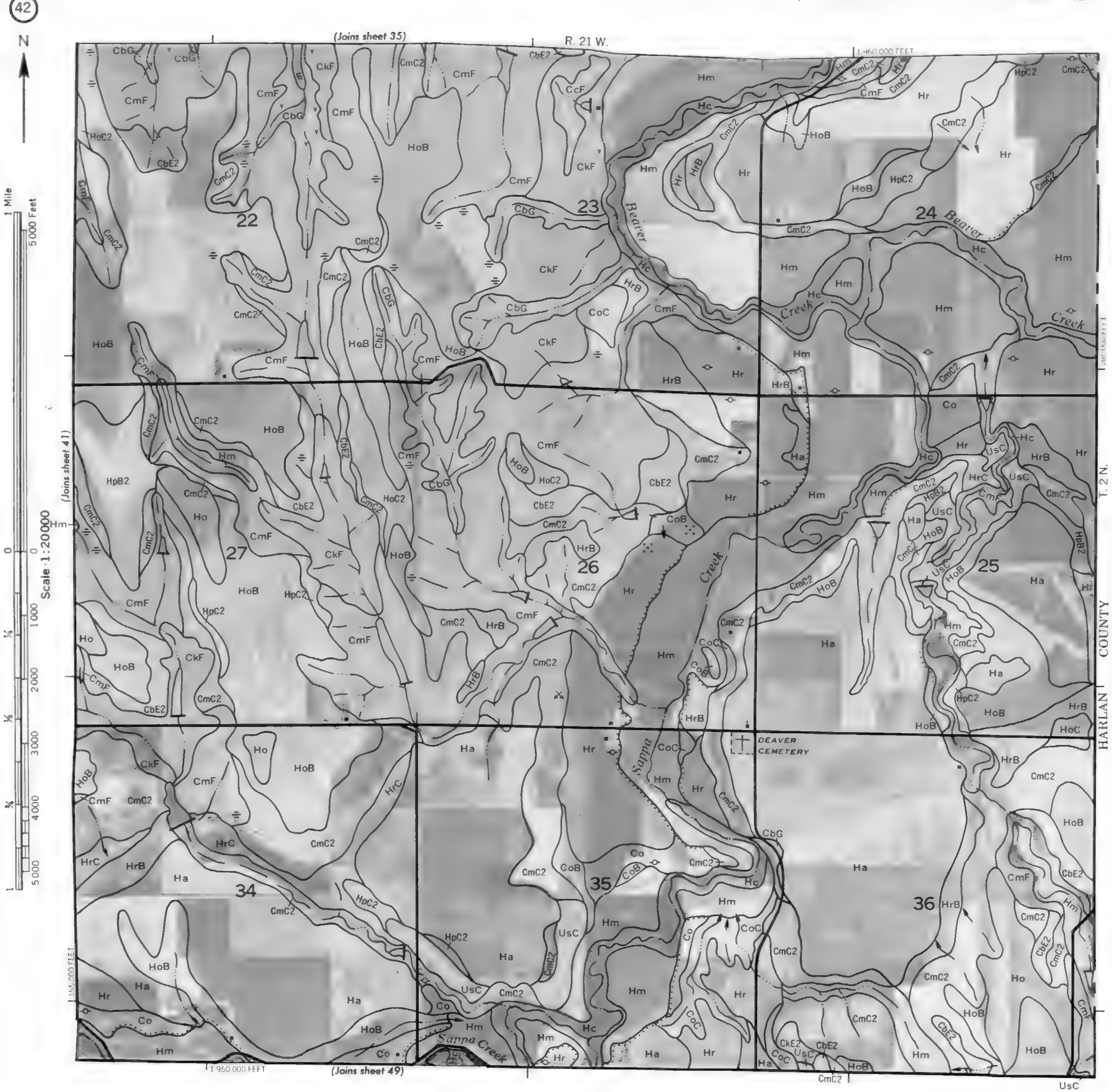


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



FURNAS COUNTY, NEBRASKA NO. 41

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

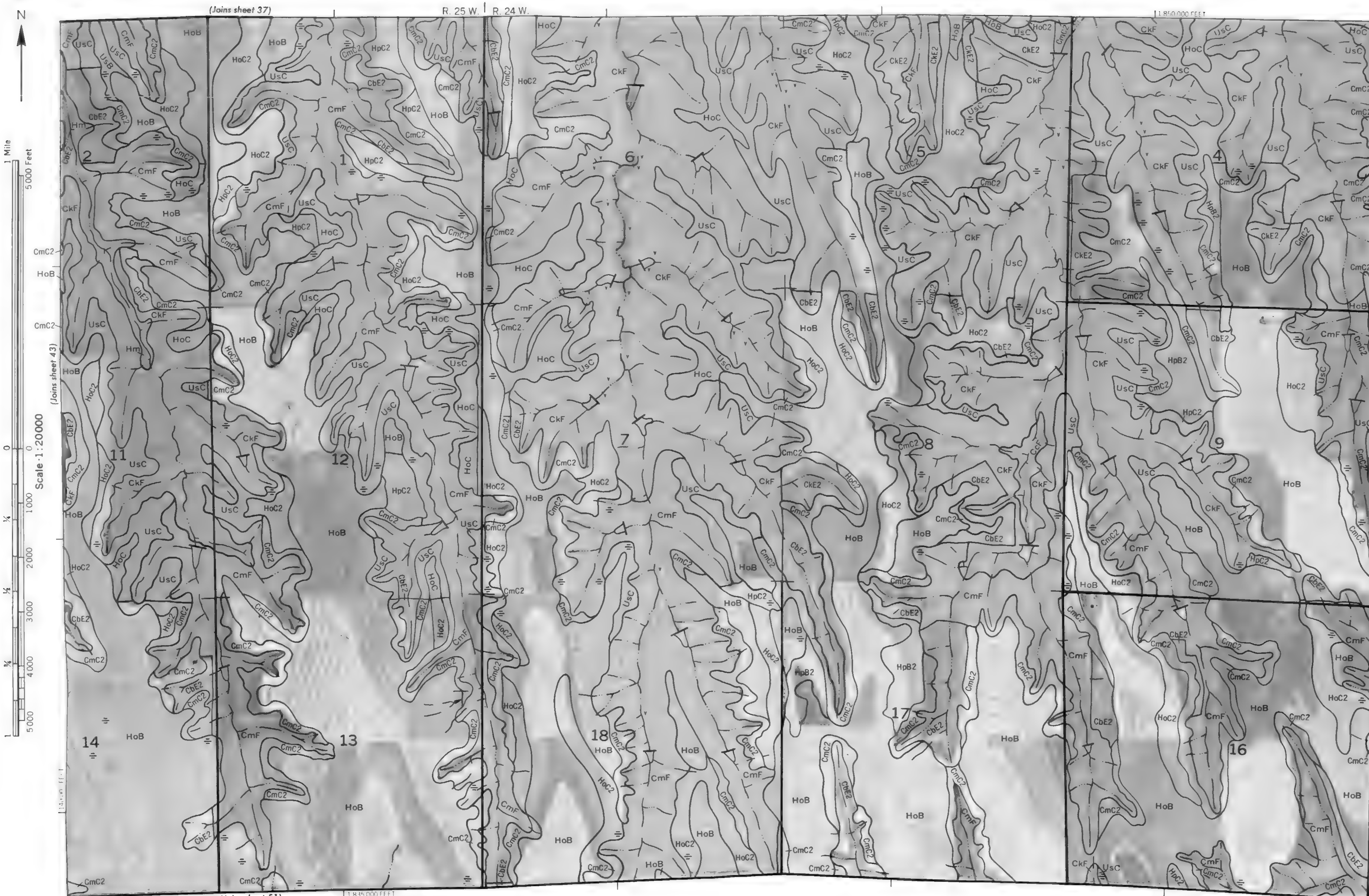


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

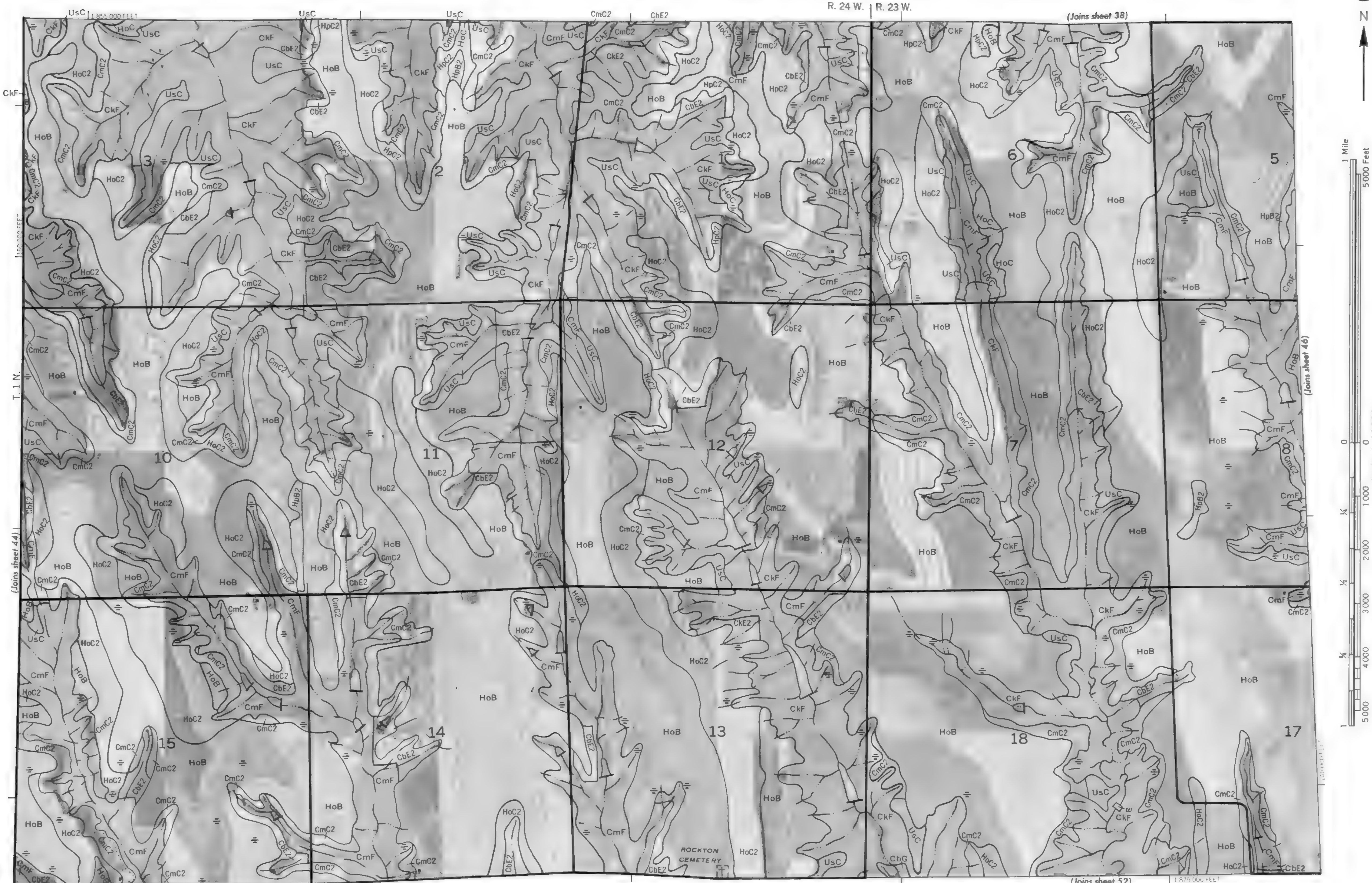
FURNAS COUNTY, NEBRASKA NO. 42

FURNAS COUNTY, NEBRASKA NO. 43

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

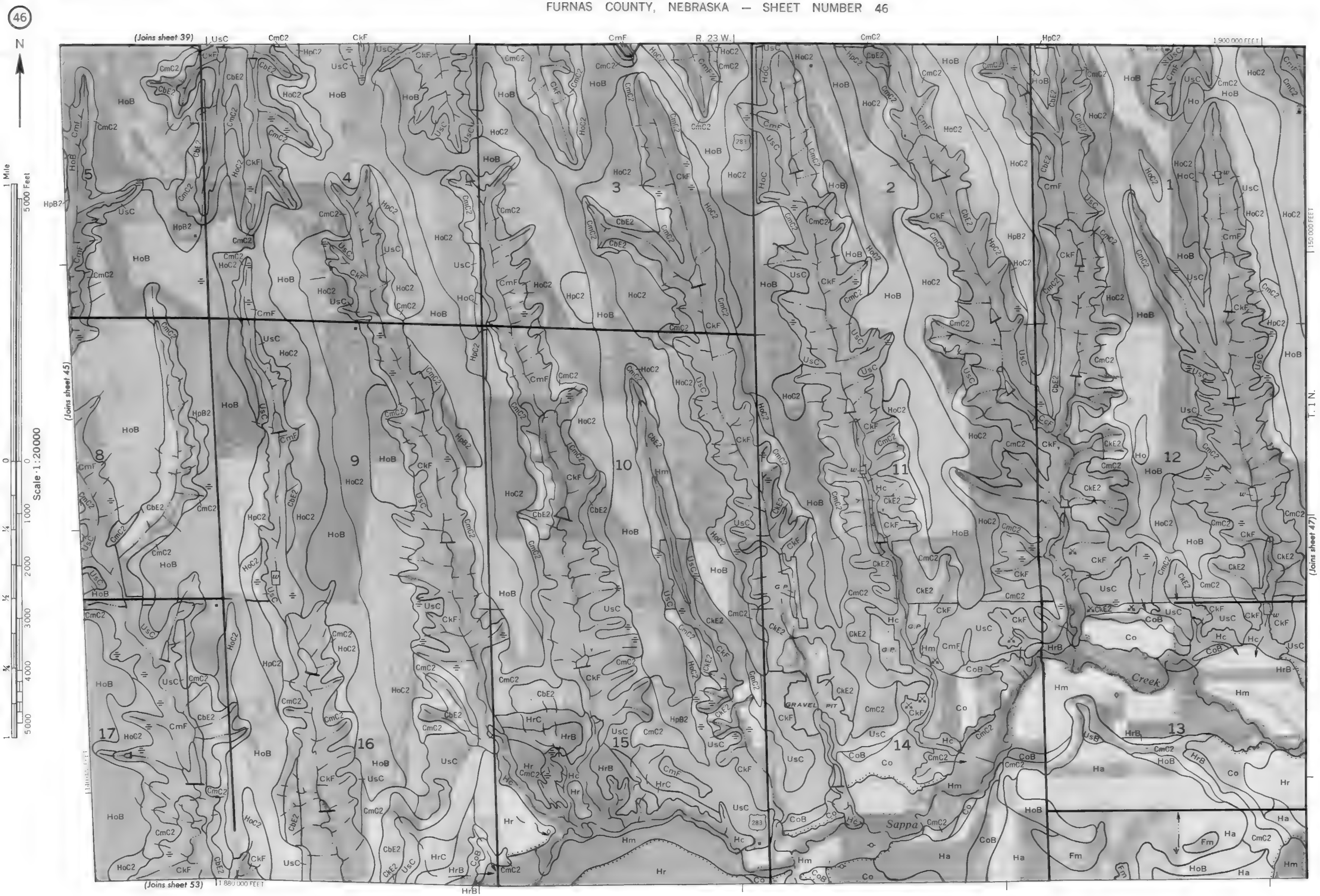


This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



FURNAS COUNTY, NEBRASKA NO. 45

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

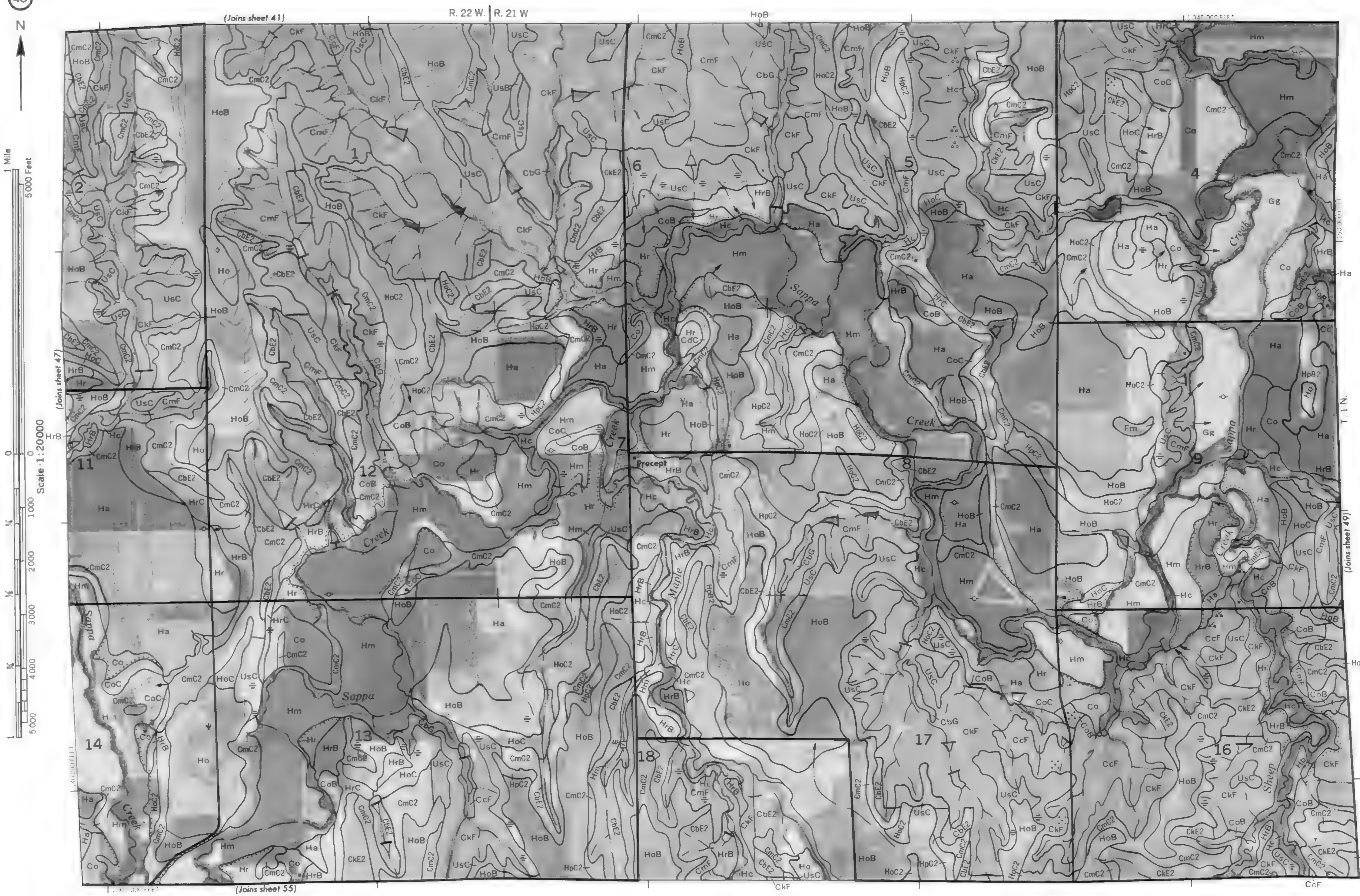


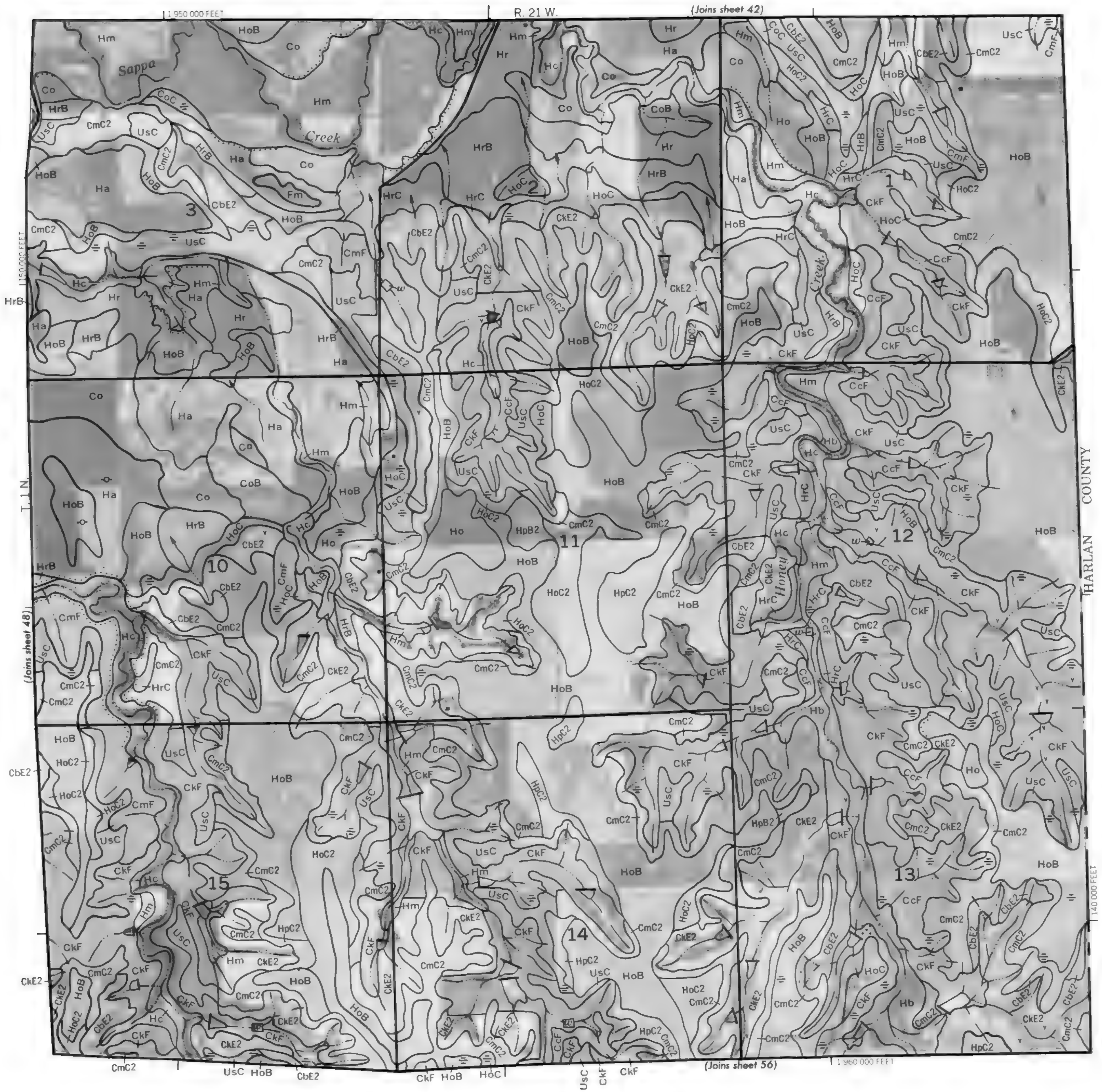
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 46

FURNAS COUNTY, NEBRASKA NO. 47

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.


48
N
(Joins sheet 41)
R. 22 W.
R. 21 W.
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 55)
T. 1 N.
1 Mile
5000 Feet
Scale 1:20000
Sappa Creek
Maple Creek
Sheep Creek
Precept
1
2
4
5
6
7
8
9
11
12
13
14
16
17
18

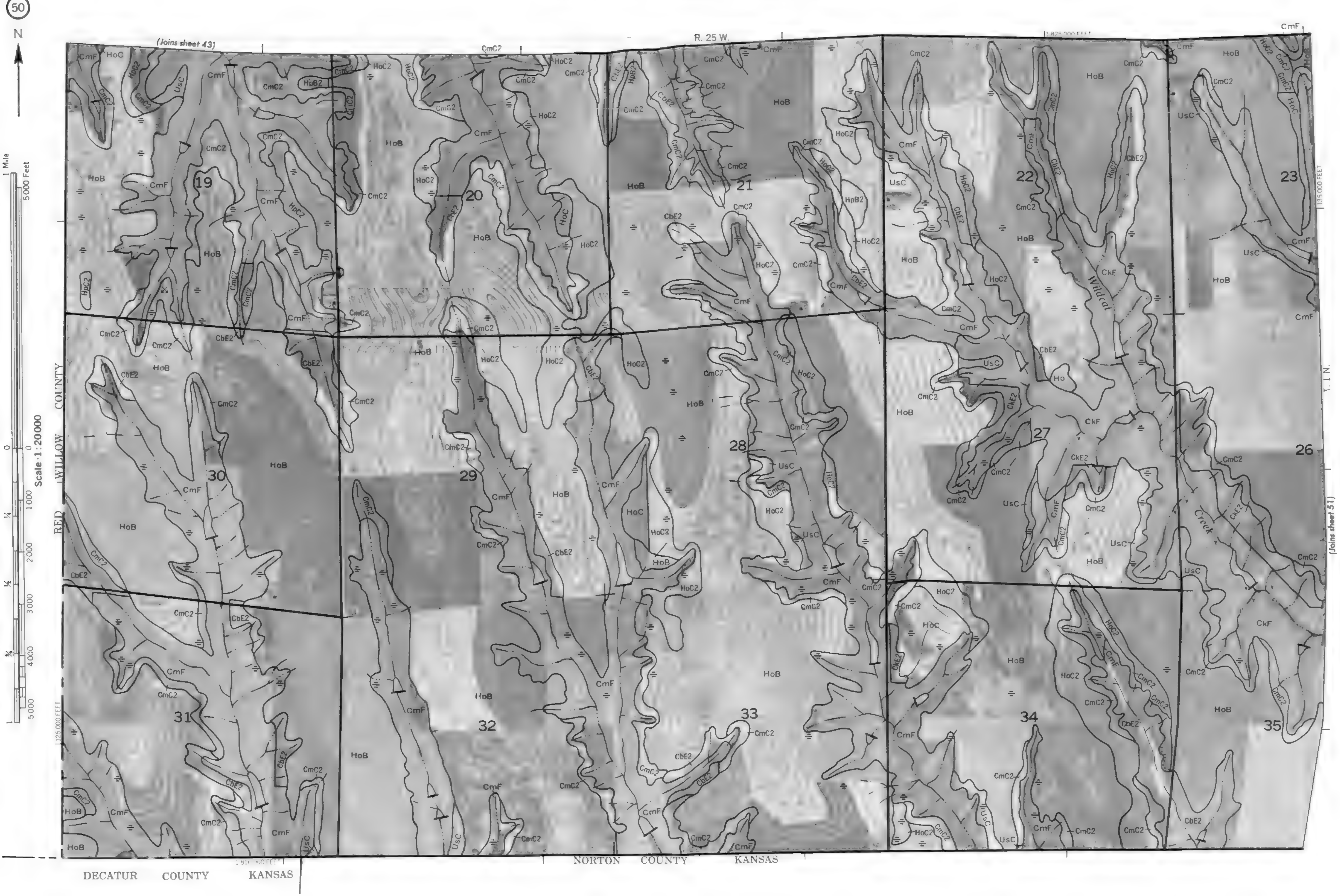


FURNAS COUNTY, NEBRASKA NO. 49

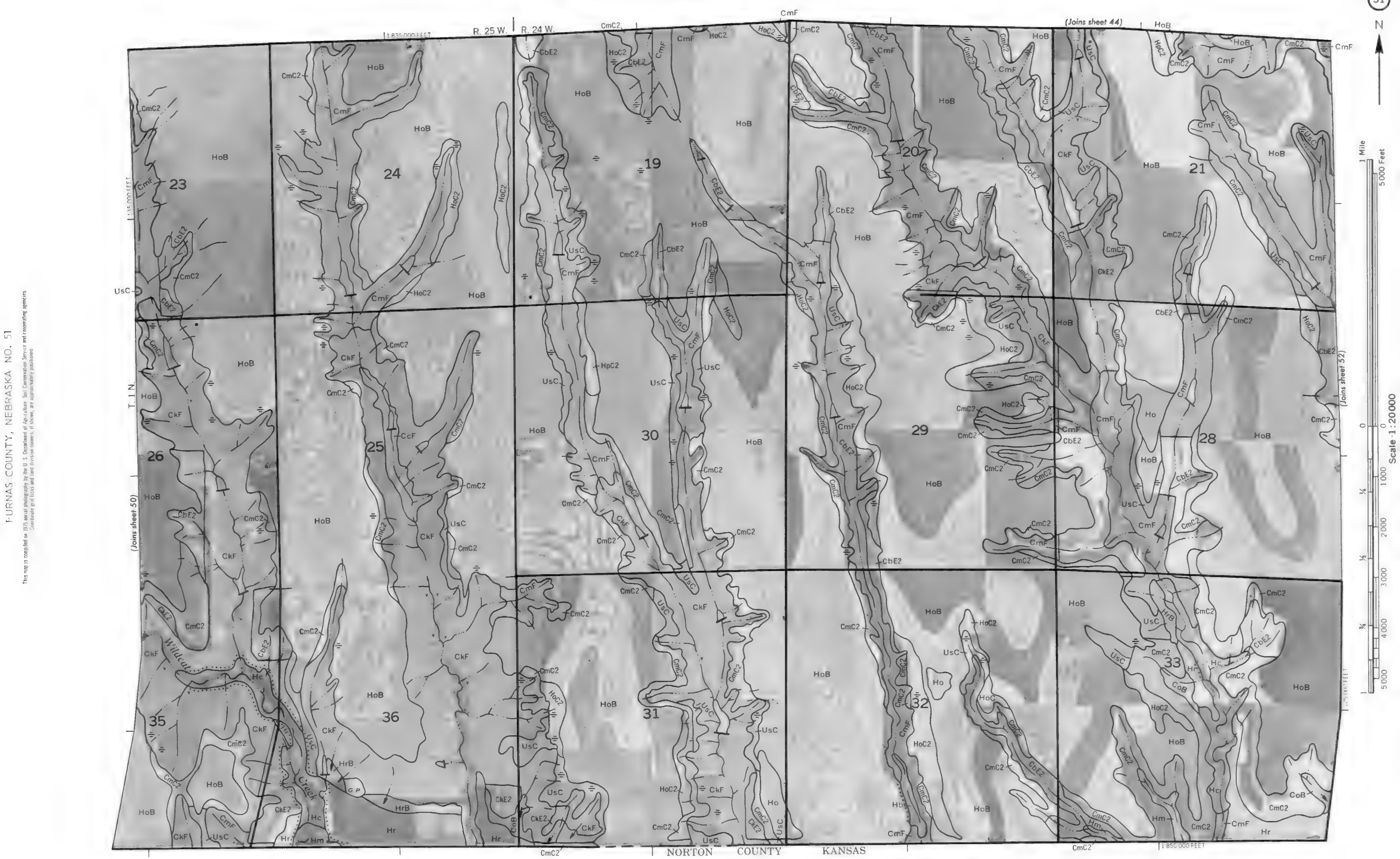
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

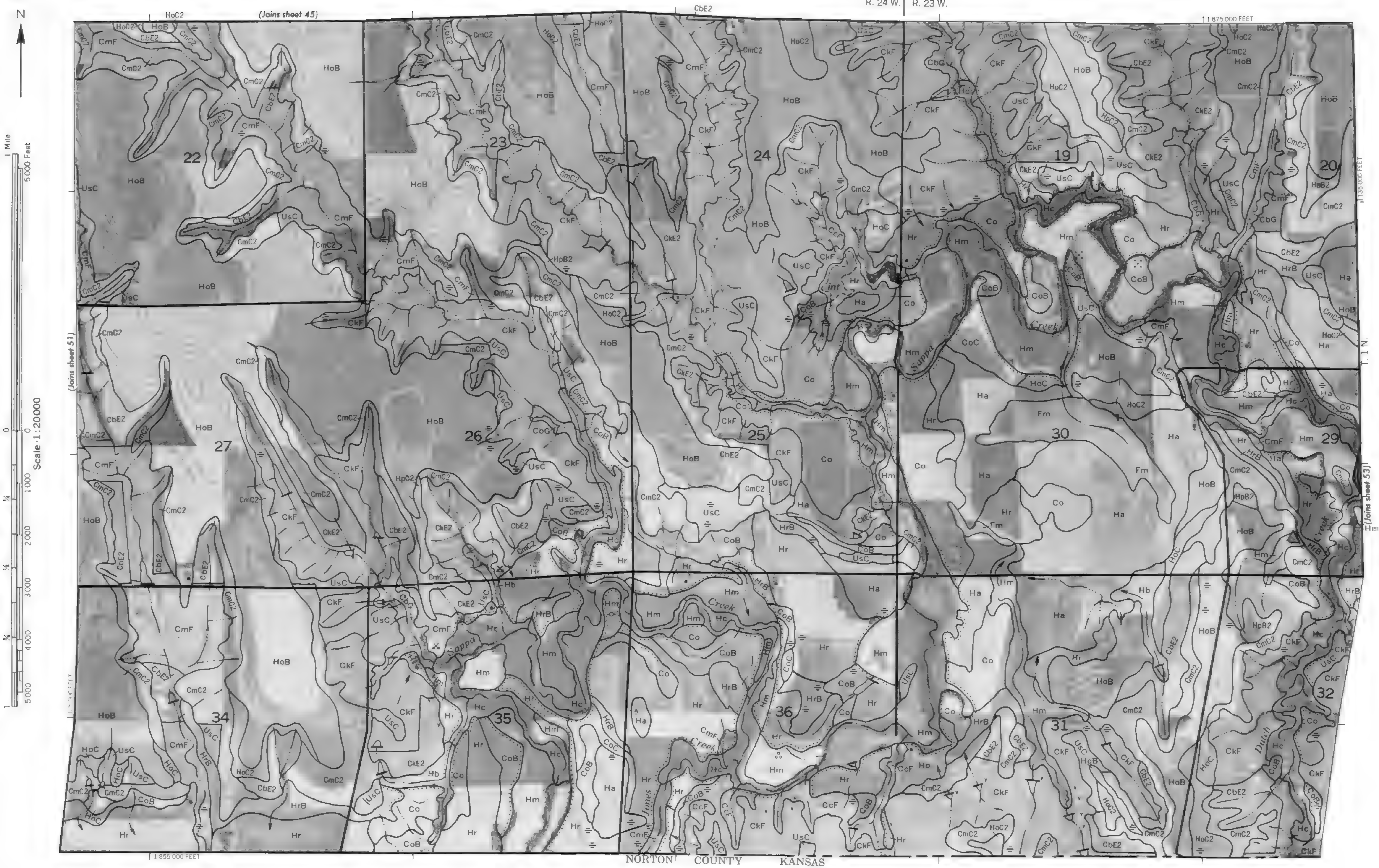
FURNAS COUNTY, NEBRASKA NO. 5

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


51
N
(Joins sheet 44)
(Joins sheet 50)
(Joins sheet 52)
R. 25 W.
R. 24 W.
T. 1 N.
NORTON COUNTY KANSAS
Wildcat Creek
Scale 1:20000
1 Mile
5000 Feet
FURNAS COUNTY, NEBRASKA NO. 51
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



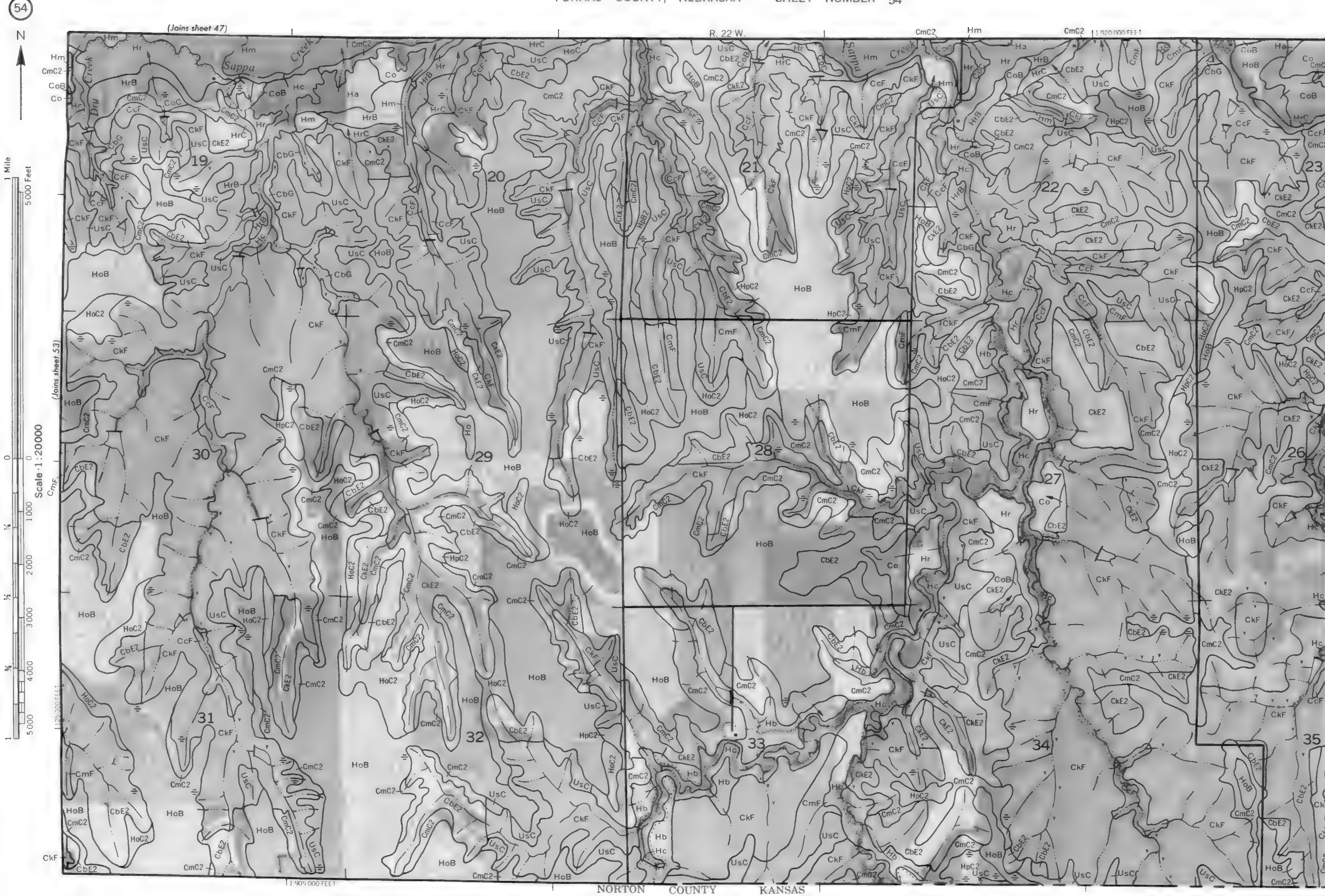
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

FURNAS COUNTY, NEBRASKA NO. 52

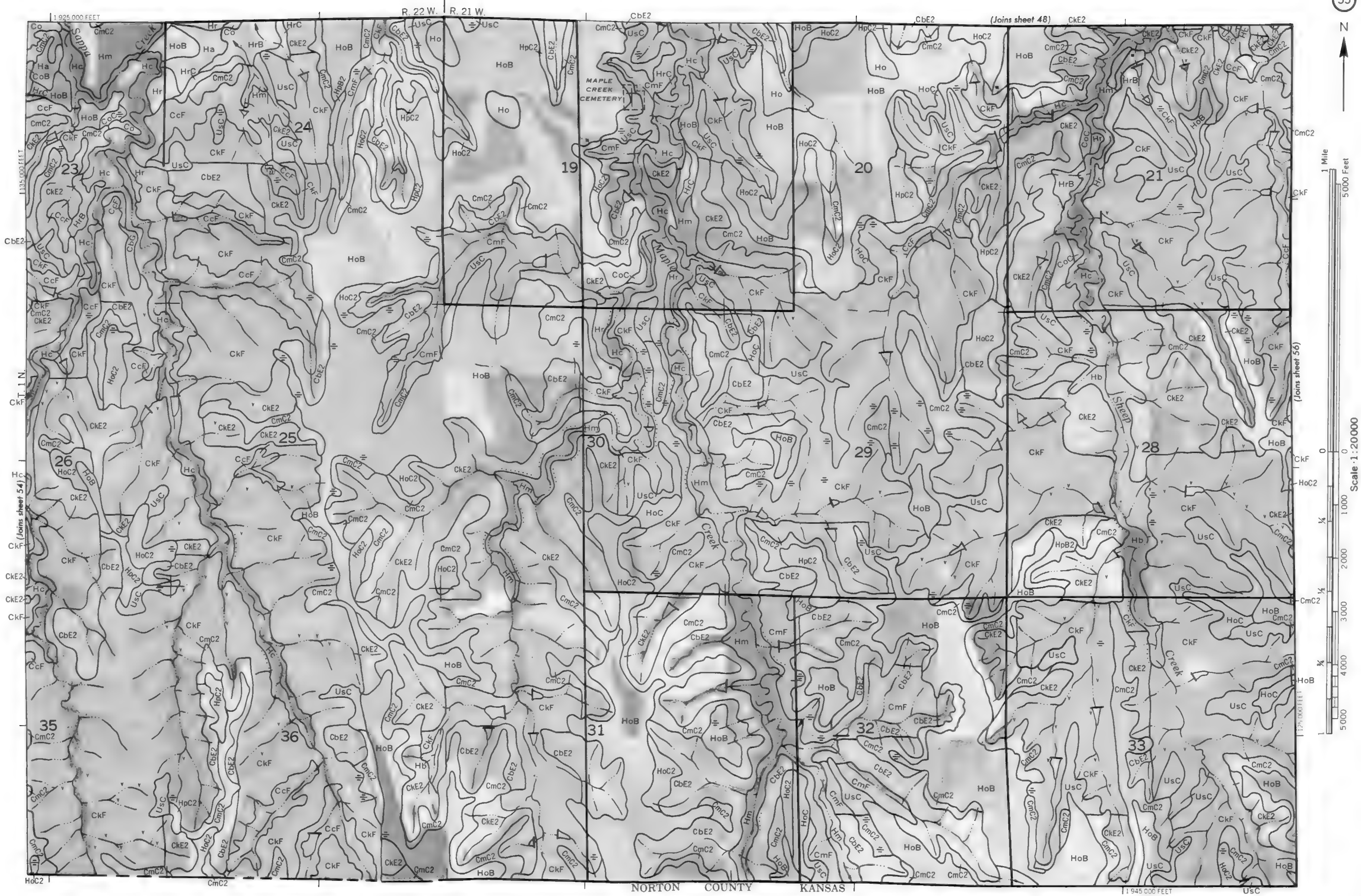
53

FURNAS COUNTY, NEBRASKA NO. 53

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



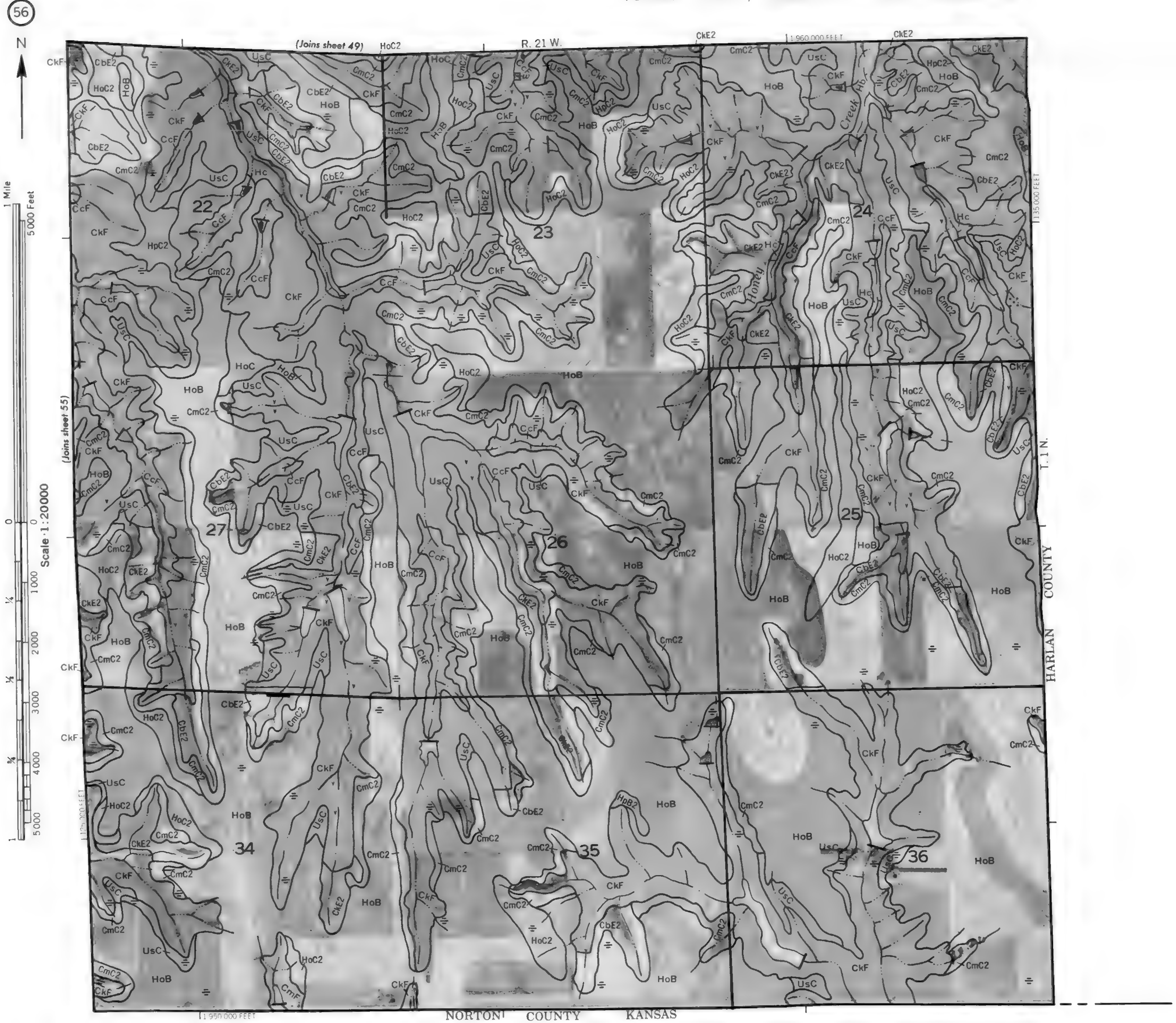
FURNAS COUNTY, NEBRASKA NO. 54



FURNAS COUNTY, NEBRASKA NO. 55

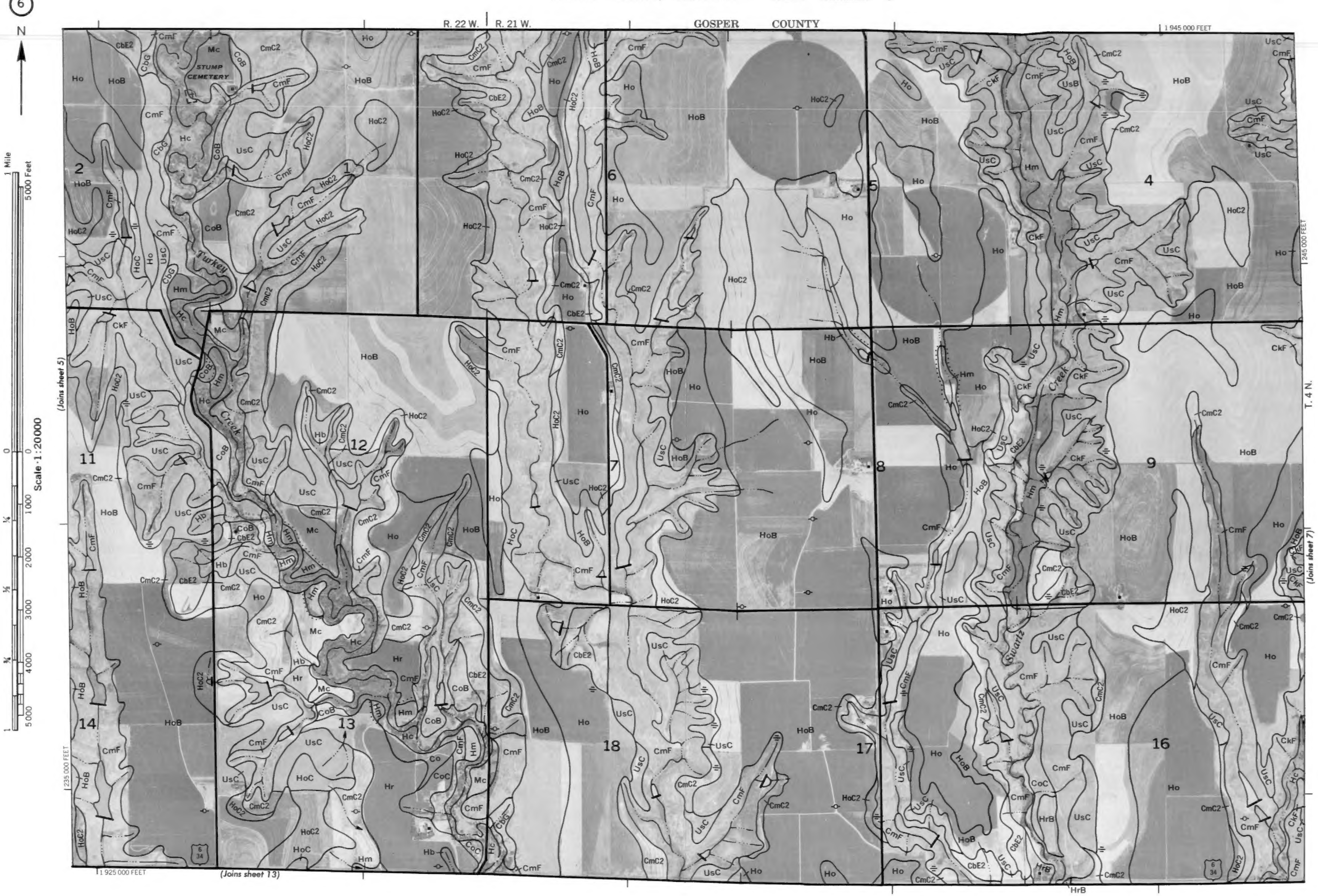
This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

56



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 56



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FURNAS COUNTY, NEBRASKA NO. 7

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(7)

N

1 Mile

5000 Feet

0 0

1/4 1000

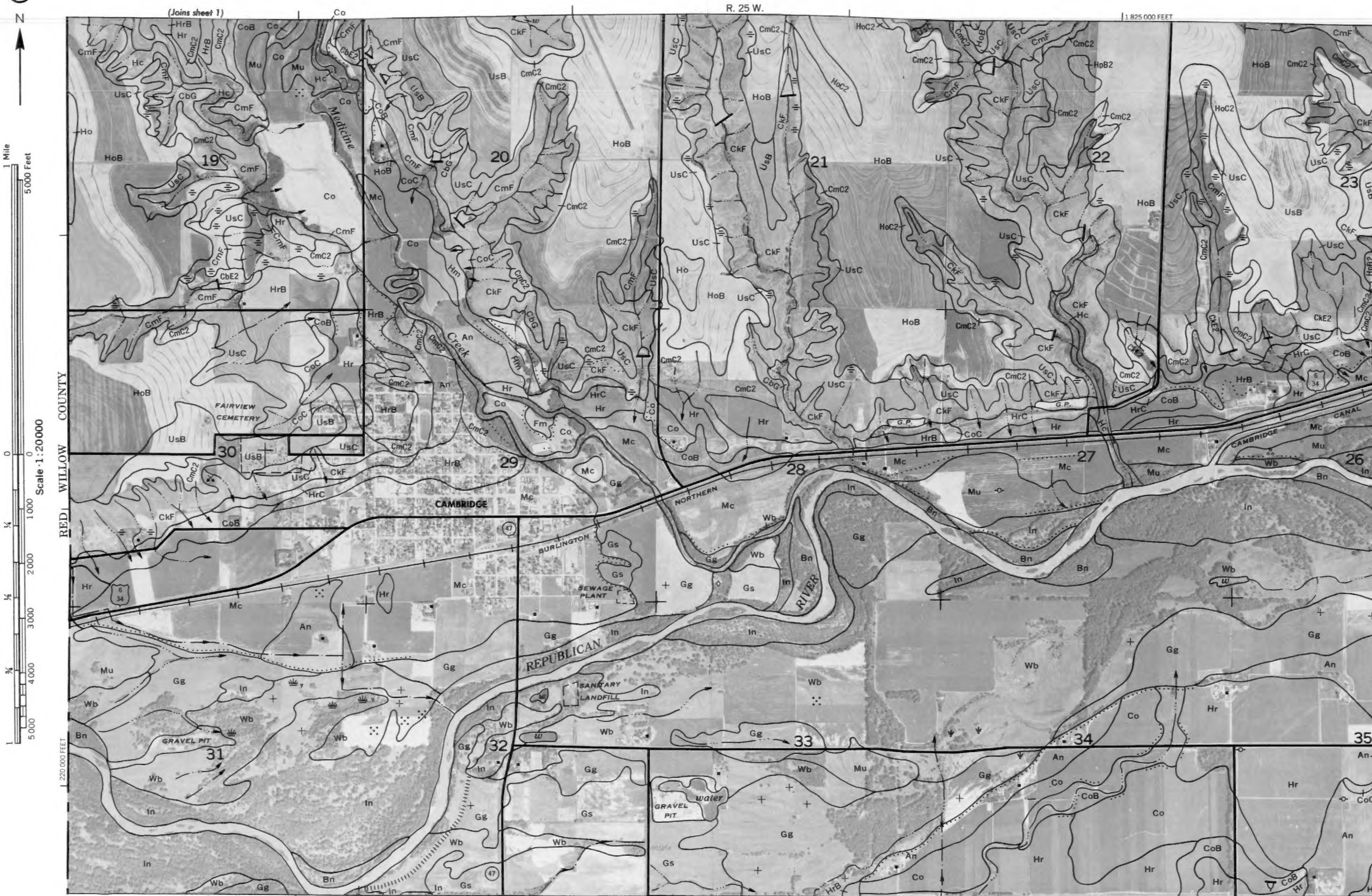
2000

1/2 3000

3/4 4000

1 5000

Scale 1:20000



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.